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The Joint Force must develop a cognitive approach to intelligence consistent with the characteristics of the contemporary environment. Joint doctrine reflects processes maximized for Cold War adversaries. This methodology is a deductive process best suited for traditional state armed conflicts. An analysis of the joint function of intelligence, from its genesis in World War I to through the post-Cold War era demonstrates that the existing approach to intelligence is obsolete. To align the intelligence approach with the environmental characteristics, the Joint Force must educate intelligence practitioners in complexity theory, advance inductive and abductive cognitive methods, and employ advanced analytic techniques.

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**THE IMPORTANCE OF WHY: AN INTELLIGENCE APPROACH FOR A MULTI-POLAR WORLD**

**by**

**Frank A. Smith**

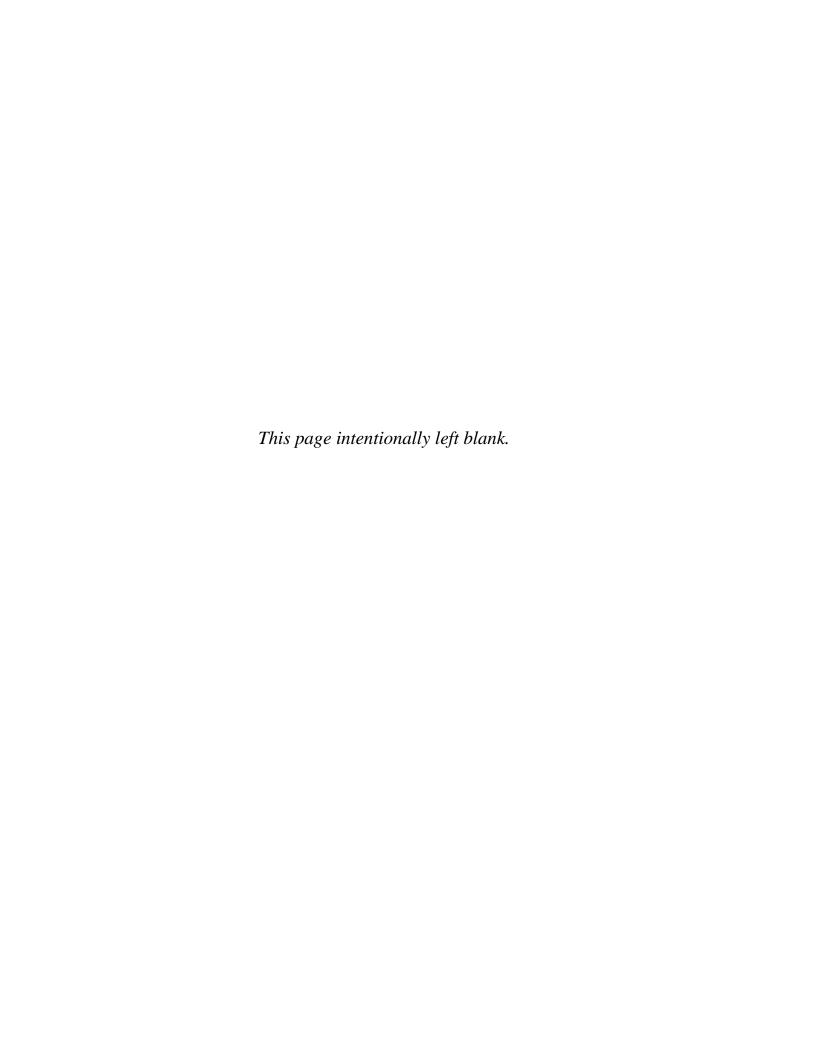*Colonel, United States Army*

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# THE IMPORTANCE OF WHY:  AN INTELLIGENCE APPROACH FOR A MULTI-POLAR WORLD

by

**Frank A. Smith**

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A paper submitted to the Faculty of the Joint Advanced Warfighting School in partial satisfaction of the requirements of a Master of Science Degree in Joint Campaign Planning and Strategy.  The contents of this paper reflect my own personal views and are not necessarily endorsed by the Joint Forces Staff College or the Department of Defense.

This paper is entirely my own work except as documented in footnotes.

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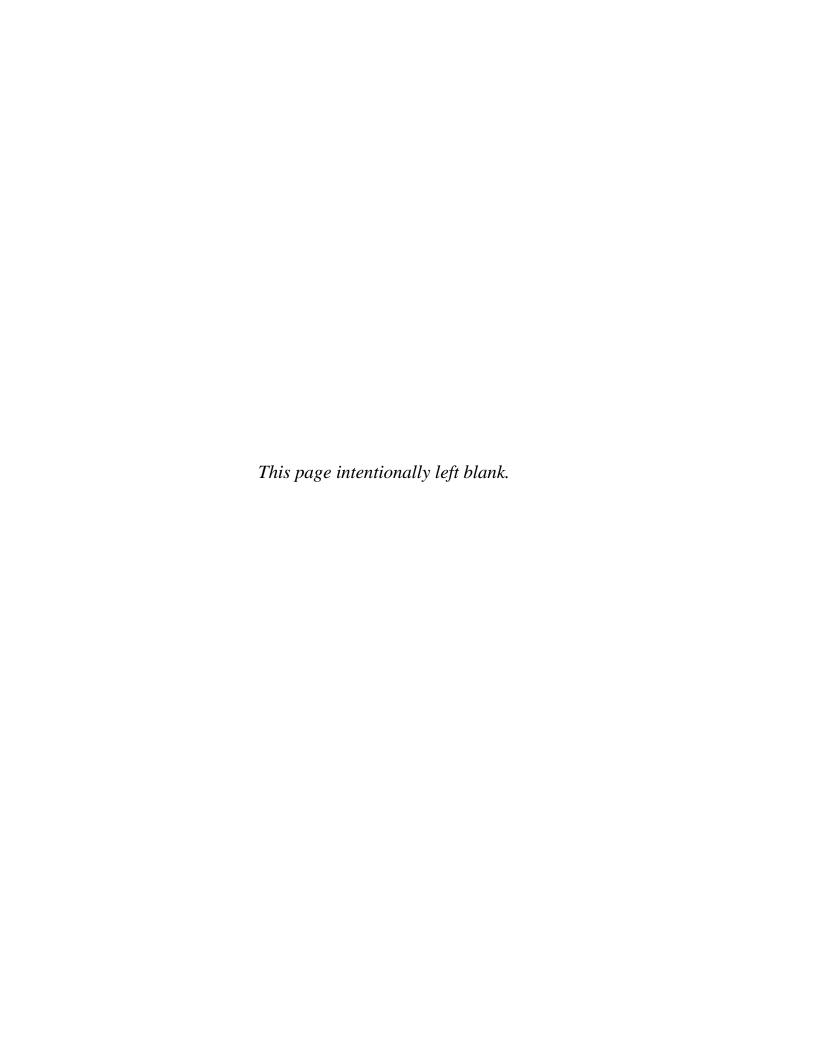
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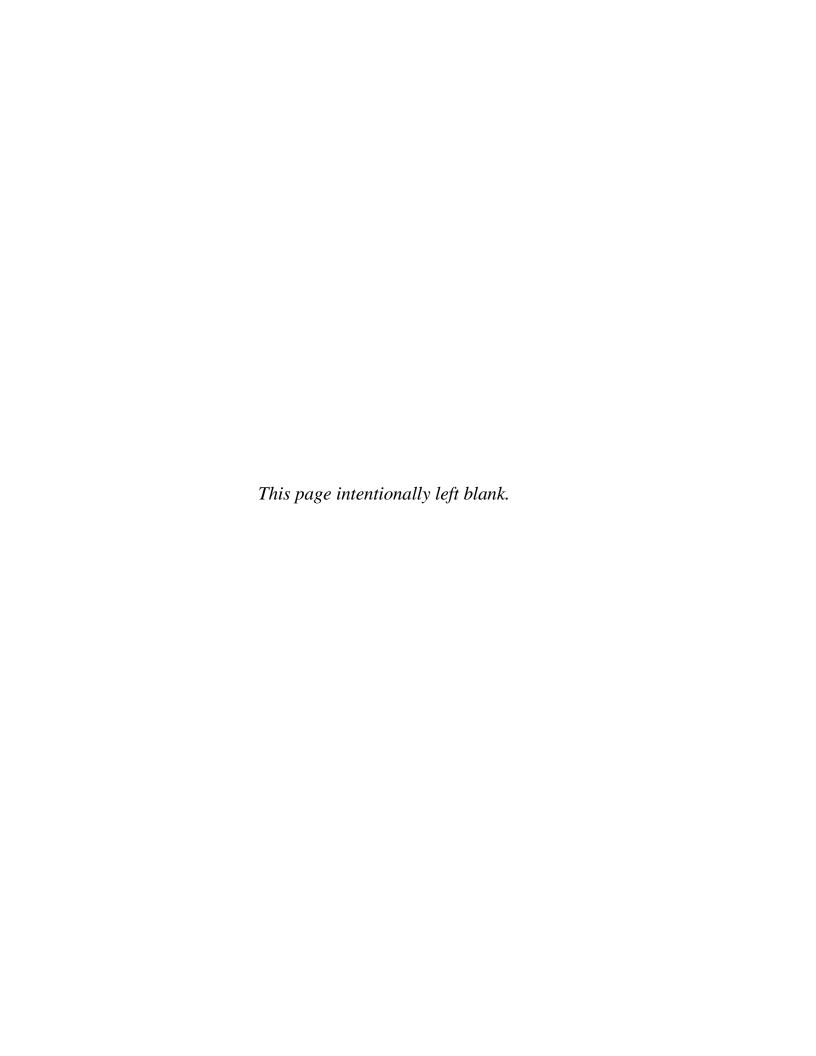
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# ABSTRACT

Sweeping changes in the political, social, and economic aspects of the strategic and operational environments require adaptations to the way the joint force plans and conducts its campaigns. In turn, these changes drive a need to change the way the joint force understands the environment—the way it derives and develops its intelligence, from which it creates its campaign plans. While the characteristics of the strategic and operational environments have changed, the U.S. joint concept for intelligence has remained static.

Existing joint force intelligence doctrine is the product of adaptations to environmental changes from World War I (WWI) through the Cold War. During WWI, intelligence operations focused on collecting adversary information—secrets—across an expansive, modern battlefield. Increases in the volume of enemy information necessitated adaptation of staff organization, resulting in an approach to intelligence founded on industrial-age organizational theory. World War II (WWII) codified the U.S. approach to intelligence through the marriage of science and intelligence to solve discreet, linear problems—puzzles. U.S. intelligence practitioners adopted a reductionist, deductive approach to estimate adversary intentions based on adversary capabilities. Exploiting the Soviet's adherence to doctrine, Cold War intelligence practitioners developed predictive intelligence techniques, adopting linear regression methods to forecast adversary actions. This approach, codified in joint intelligence doctrine today, is maximized for a bygone era of bipolar state-based armed conflicts.

An increase in the tempo and degree of complexity within the contemporary global system renders traditional analytic methods ineffective. Traditional analytic methods operate on the premise of linearization—that linear models approximate a nonlinear system sufficiently to explain the system. As the tempo and degree of complexity increases, the sufficiency of linear models to approximate the nonlinear system decreases. The environment no longer presents a puzzle. It presents a mystery—an abstract problem with multiple possible outcomes. Resolving mysteries requires a shift from solving *what* an adversary will do to understanding *why* an adversary or operational problem has emerged.

Consequently, the joint force must develop an approach to intelligence that is logically consistent with the characteristics of the contemporary environment. First, the joint force must ground its approach in theory that accounts for the characteristics of complexity. Second, it must shift from a reliance on a deductive cognitive method to one inclusive of inductive and abductive methods. Third, intelligence must retain existing analytic techniques, but broaden analysts' skillsets to include advanced analytic techniques and apply these techniques in a manner consistent with the characteristics of complex systems. Shifting the intelligence approach from *what* an adversary is doing and estimating *what* that adversary will do next to *why* an adversary or operational problem has emerged is a significant shift from the direction of over 100 years of intelligence development. However, it is the fundamental difference between solving puzzles and resolving mysteries.

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# CONTENTS

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## Acronyms

| | |
|---|---|
| AEF | American Expeditionary Forces |
| BMI | Bureau of Military Information |
| CCMD | Combatant Command |
| CI | Counterintelligence |
| DoD | Department of Defense |
| DOTMLPF | Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities |
| DIA | Defense Intelligence Agency |
| DTA | Dynamic Threat Assessment |
| IC | Intelligence Community |
| IPB | Intelligence Preparation of the Battlespace |
| ISIL | Islamic State of Iraq and the Levant |
| JCIC | Joint Concept for Integrated Campaigning |
| JFC | Joint Forces Commander |
| JIPOE | Joint Intelligence Preparation of the Operational Environment |
| JOPP | Joint Operational Planning Process |
| MID | Military Intelligence Division |
| MI5 | Military Intelligence-5, British Special Branch |
| MI6 | Military Intelligence-6, British Secret Intelligence Service |
| NATO | North Atlantic Treaty Organization |
| NIE | National Intelligence Estimate |
| OE | Operational Environment |
| PMESII | Political, Military, Economic, Social, Information, and Infrastructure |
| SE | Strategic Environment |
| U.S. | United States |
| USSR | Union of Soviet Socialist Republics |
| WWI | World War I |
| WWII | World War II |

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**Introduction**

The U.S. military's approach to intelligence must change to be relevant in the twenty-first century. This claim is not new. U.S. flag officers, commanders, and staff officers have provided volumes of observations from Operation IRAQI FREEDOM and Operation ENDURING FREEDOM identifying a severe disconnect between the complexity of the battlefield and their ability to understand it.[1] Intelligence is responsible for explaining the environment and estimating the intentions of the adversary. Intelligence enables the commander's decision-making. If commanders cannot understand the environment, it is an intelligence shortcoming.

Over the last twenty-five years, the global landscape has undergone a metamorphosis.[2] Sweeping changes in the political, social, and economic aspects of the strategic environment (SE) and the operational environment (OE) require adaptations to the way the joint force plans and conducts its campaigns. In turn, these changes drive a need to change the way the joint force understands the SE and OE—the way it derives and develops its intelligence, from which it creates its campaign plans. An analysis of the military function of intelligence, from its genesis in World War I (WWI) to its most

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[1] Michael T. Flynn, Matt Pottinger, and Paul D. Batchelor, "Fixing Intel: A Blueprint for Making Intelligence Relevant in Afghanistan," Center for New American Security *Voices from the Field,* January 2010, https://www.cnas.org/files/documents/publications/AfghanIntel_Flynn_Jan2010_code507_voices.pdf (accessed December 30, 2015) and Stanley McChrystal with Tatum Collins, David Silverman, and Chris Fussel, *Team of Teams: New Rules of Engagement for a Complex World* (New York: Penguin Random House, 2015). 14, 54, 57-59, 68-72.

[2] Mary Kaldor, *New and Old Wars: Organized Violence in a Global Era,* Third Edition (Stanford, CA: Stanford University Press, 2012), 3-6.

recent form in the post-Cold War era, reveals an obsolete practice incapable of understanding and explaining the complexity of the modern operational environment.

While the characteristics of the strategic and operational environments have changed, the U.S. joint concepts for both intelligence and operations have remained static. The Joint Staff is currently developing a new approach to campaigning that addresses the challenges associated with designing operations in the modern strategic and operational environments. The U.S. Joint Staff must develop an approach to operations and intelligence that complement each other in an integrated campaign concept. This research informs the Joint Staff effort by evaluating the sufficiency of existing intelligence practices.

Critically reviewing the joint force approach to intelligence estimates, this research demonstrates that the joint force must revise its conceptual approach to intelligence analysis, accounting for the characteristics of the modern environment. The Joint Force must make three adaptations to its approach to intelligence to keep intelligence relevant in the contemporary environment. First, the Joint Force must ground its conceptual approach to intelligence in theory that accounts for the characteristics of complex environments. Second, it must shift from a reliance on a deductive cognitive method to one inclusive of inductive and abductive methods. Third, intelligence must retain existing analytic techniques, but broaden analysts' skillsets to include advanced analytic techniques and apply these techniques in a manner logically consistent with the characteristics of complex systems.

The state and military practices of espionage and reconnaissance evolved through the interaction of policy, political action, and military action reaching back to ancient times. However, the military function of intelligence emerged on the battlefields of WWI. From that perspective, a study of two eras (1914-1945 and 1945-1991) instrumental in shaping the modern intelligence phenomenon leads to an understanding of the interplay between the characteristics of the strategic and operational environment and the emergence of modern intelligence practices. A third era (1991-2016) presents evidence of recent, significant political, social, and economic changes in the environment, which provide a cause for comparative study.

Chapter 1 defines intelligence and describes the phenomenon of intelligence as it relates to the political phenomena of state policy and war.[3] Appendix A provides a deeper study of the intelligence phenomenon and highlights two competing theories of intelligence that inform the recommendation.

The modern joint function of intelligence found its genesis on the battlefields of World WWI. Chapter 2 summarizes the organization of intelligence as a military specialty from WWI through the interwar years. It demonstrates how intelligence organization evolved tailored to the characteristics of the strategic and operational environment. For the interested reader, Appendix B provides a short summary of the development of state *surveillance* and military *reconnaissance,* the predecessors to modern intelligence, through the nineteenth century. Appendix B concludes with a brief

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[3] Gregory F. Treverton and Wilhelm Agrell, eds., *National Intelligence Systems: Current Research and Future Prospects* (New York: Cambridge University Press, 2009), 278-279.

comparison of procedures in the U.S. and Europe during the nineteenth century to provide context to the analysis in Chapter 2.

Chapter 3 summarizes how traditional scientific methods, emergent game theory, and deductive reasoning influenced the development of intelligence analysis during WWII and the Cold War. Within this era, practitioners developed intelligence as a craft that evolved into an experience-based practice. This chapter demonstrates that intelligence practices evolved commensurate with the political, social, and technical trends of the time.

Chapter 4 evaluates the strategic and operational conditions since the end of the Cold War and examines the joint doctrinal approach to adversary estimation. Through an overview of General Systems Theory (GST), complexity theory, and game theory, it explains why earlier approaches to intelligence worked through the Cold War, but are inadequate in the complexities of the contemporary environment.

Chapter 5 presents a recommendation for a Joint Concept for Intelligence in support of the Joint Staff's approach to integrated campaigning. This chapter builds on conclusions other intelligence professionals have presented, integrating a shift in the conceptual approach to intelligence with a set of intellectual constructs better suited to the characteristics of the contemporary environment. This chapter explains and recommends a set of cognitive methods and advanced analytic techniques to improve intelligence estimates in complex environments. It does not cast aside the traditional analytic technics that continue to prove valuable against well-bounded problems, but it

integrates modern theory and intellectual techniques better suited to the ill-bounded problems of the complex environment of the twenty-first century. Appendix C: A Thought Experiment compliments the recommendation by providing a conceptual application of the recommended framework using the current Levant situation.

While not a complete analysis of Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF), this concept provides a starting point for further research. Finally, it is important to note that intelligence activities and methods for collection are generally sensitive in nature and beyond the scope of this research. Nevertheless, competing ideas on the organization of intelligence and the use of analytic techniques are generally available and considered.

## Chapter 1:  A Theory of Intelligence

Academics and intelligence professionals recently argued, "Intelligence analysis stands out as a genuine cross-disciplinary science in-being, with a theoretical basis and a set of methods not limited to any single subject matter or field of analysis but rather adapted to every specific application."[1]  History should reveal that intelligence practitioners adapted their approach to meet the character of their strategic and operational environments.  A review of existing literature demonstrates that while there is not an agreed upon theory of intelligence, significant research exists to form a basis for comparative study.[2]

### Intelligence Defined

Defining intelligence is critical to understanding its relationship with policy and strategy, which in turn informs its proper functions, organizations, and authorities.[3] Intelligence includes information, agencies, and actions.  All intelligence activities concern information collection and analysis, but not all state activities that involve the collection and analysis of information are intelligence.  U.S. joint doctrine defines intelligence as the "product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential

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[1] Wilhelm Agrell, "The Science of Intelligence:  Reflections on a Field That Never Was," in Treverton and Agrell, eds, *National Intelligence Systems: Current Research and Future Prospect*, 278-279.
[2] Appendix A explains the intelligence phenomenon and summarizes two competing theories of intelligence that inform the intelligence approach recommendation in Chapter 5.
[3] Michael Warner, "Building a Theory of Intelligence Systems," in Treverton and Agrell, eds., *National Intelligence Systems: Current Research and Future Prospects,"* 15, 19.

operations. [It is] the activities that result in the product [and the] organizations engaged in such activities."[4]

The joint definition defines what intelligence is (the product) and what intelligence does (collect, process, integrate, evaluate, analyze, and interpret information). However, the definition lacks why joint forces conduct intelligence activities or produce intelligence products. Doctrine explains the relationship between intelligence activities and operational planning in the operations narrative, "It is essential that commanders…first gain an understanding of the operational environment and define the problem facing the joint force prior to conducting detailed planning."[5] Doctrine then links the commander's need for understanding of the OE with the purpose of the joint function of intelligence.

> The intelligence function supports [the commander's understanding of the operational environment] by providing integrated, evaluated, analyzed, and interpreted information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations. Intelligence tells [Joint Forces Commanders] what the enemy is doing, is capable of doing, and may do in the future. These assessments are important to acting inside the enemy's decision cycle. Thus, intelligence must be sufficiently detailed and timely to satisfy the commander's decision-making needs.[6]

To summarize, intelligence includes both information and activities concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or

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[4] U.S. Joint Chiefs of Staff, *Department of Defense Dictionary of Military and Associated Terms,* Joint Publication 1-02 (Washington, D.C.: Joint Chiefs of Staff, 8 November 2010 (As Amended Through 15 October 2015)), s.v. "intellgence," p 118.
[5] U.S. Joint Chiefs of Staff, *Joint Operation Planning*, Joint Publication 5-0 (Washington, D.C.: Joint Chiefs of Staff, August 11, 2011), III-6.
[6] U.S. Joint Chiefs of Staff, *Joint Operations*, Joint Publication 3-0 (Washington, D.C.: Joint Chiefs of Staff, August 11, 2011), III-20.

potential operations produced to inform decision makers and focus planning.  It is

subordinate to policy, but informs policy by providing decision makers with an

information advantage over their competitors.  Secrecy has played a central role in state

intelligence activities, but as the array of threats diverges, timely delivery of intelligence

information and an ability to share that information with non-traditional decision makers

may provide greater relevance in certain situations.[7]

## The Nature of the Intelligence Problem

Intelligence informs policy, can shape policy, and, if one is not careful, be shaped

by policy.[8]  Intelligence is a political phenomenon that transcends the spectrum between

war and peace.  The purpose of intelligence is to provide decision makers with an

information advantage over their adversaries, reducing uncertainty in the competitive

environment.  By understanding the characteristics of the environment and the intent of

the competitors in that environment, decision makers are better postured to form policy

and develop strategy to achieve U.S. national interests.  Of course, competitive entities—

adversaries—endeavor to obscure the true nature of their capabilities and intent, making

complete accuracy often unattainable.

The joint intelligence function informs decision makers through a regimented

intelligence estimate process, developed from combat experience throughout the

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[7] Warner, "Building a Theory of Intelligence Systems," 11-37 and Jennifer E. Sims, "A Theory of Intelligence and International Politics," in Treverton and Agrell, eds, *National Intelligence Systems: Current Research and Future Prospects,"* 58-92.

[8] Mike Hayden, "Politicization of Intelligence on Islamic State Fight," *The Washington Times* website, September 24, 2015, http://www.washingtontimes.com/news/2015/sep/24/politicization-the-shading-of-analysis-to-fit-prev/?page=all (accessed February 5, 2016).

twentieth century. Practitioners, through trial and error, established the craft and developed it over time into the modern joint function of intelligence. The sequencing of the intelligence process compliments the joint planning process in which the staff informs decision makers through the production and delivery of planning products. The question remains, does that regimented estimate process employ the best cognitive approach to provide intelligence estimates of a complex operational environment? To answer that question, one must understand how the military function of intelligence developed.

Within the Great Wars and Cold War eras, the interplay of the world powers influenced the development of each state's intelligence organization. This influence is most prevalent in the partnership formed between Great Britain and the U.S. and in the intelligence contest those two nations waged against the USSR. On the battlefields of WWI, Western militaries realized the value of organizing staffs to collect secrets and manage the flow of adversarial information. From the battlefields of WWII and the ensuing competition against the USSR during the Cold War, the Anglo-American approach to intelligence shifted from stealing secrets to solving puzzles. Puzzle solving remains the central idea behind the U.S. Joint Force approach to intelligence.

**Chapter 2:  Secrets:  Organizing Staffs to Manage Adversarial Information**

A secret is "something concrete that can be stolen by a spy or discerned by a technical sensor."[1]  Secrets include composition and disposition of enemy forces, orders, doctrine, and statements of intent.  They are the intelligence facts.  Withholding secrets generates an information advantage over one's opponent while discovering the opponent's secrets eliminates his information advantage.  Commanders gain advantage in war by withholding information from their adversaries.[2]  To gather the secrets of the twentieth century battlefield, militaries had to adapt to collect and manage the information their commanders required.  Drawing from existing cognitive methods and labor management principles, military leaders formed new organizations called intelligence staffs.

**World War I:  Organization of Intelligence Functions**

WWI was the birth of modern warfare.  It transformed warfare from a two dimensional phenomenon to a three dimensional phenomenon.  Its technology changed the character of war, rendering nineteenth century strategy and tactics obsolete.[3]  WWI was an enormous endeavor that extended theaters of operation to a global scale and increased human suffering exponentially, tallying the dead in terms of millions.  Motorization and mechanization increased mobility.  Advancements in artillery fire and the introduction of the machine gun increased the breadth and depth of the battlefield.

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[1] Joseph S. Nye, Jr., "Peering into the Future," *Foreign Affairs*, 77, 4 (July/August 1994), 88.
[2] R. Duncan Luce and Howard Raiffa, *Games and Decisions: Introduction to Critical Survey* (New York: Dover Publications, 1957), 39-43.
[3] Eugene M. Emme, "Technical Change and Western Military Thought:  1914-1945," *Military Affairs*, Vol. 24, No. 1 (Spring, 1960), pp. 6-19, http://www.jstor.org/stable/1983567 (accessed August 24, 2015).

Radio provided the means for commanders, grappling with the expanse of the battlefield, to send and receive orders and reports rapidly. The airplane provided a means to scout and then bomb beyond the adversary's front lines. In total, the resulting high-intensity conflict brought timing in terms of tempo and simultaneity to critical importance.[4] In WWI, intelligence became crucial to targeting and maneuver.

Intelligence in WWI focused on collecting secrets. While the traditional *reconnaissance* missions of scouts and cavalry continued, the stagnation of trench warfare combined with the extended breadth and depth of the battlefield to limit their usefulness. Therefore, necessity and the introduction of new technology provided a stimulus for intelligence adaptation. Radio communication led to nascent signals collection and cryptology developed in concert with signals collection. Consequently, the traditional use of human collection to gather key documents such as codebooks continued. The introduction of the airplane provided a means of aerial reconnaissance, providing commanders with scouts capable of surveying along and behind enemy lines. Combining the airplane and camera resulted in imagery intelligence. The subsequent need to assemble and interpret the resultant flow of information from collection drove the development of division of labor processes and staff organization.[5]

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[4] Jonathan B. A. Bailey, "The First World War and the Birth of Modern Warfare," in MacGregor Knox and Williamson Murray, eds., *The Dynamics of Military Revolution: 1300-2050* (New York: Cambridge University Press, 2001), 132-133 and Geoffrey Parker, ed., *Cambridge Illustrated History: Warfare* (New York: Cambridge University Press), 1995, 243.

[5] MichaelWarner, *The Rise and Fall of Intelligence: An International Security History* (Washington, D.C.: Georgetown University Press, 2014)*, 39, 50-56.

As WWI unfolded, commanders faced the challenge of organizing their staffs to conduct operational planning. Reductionist techniques were common amongst the European militaries, an obvious byproduct of the Industrial Revolution and Frederick Winslow Taylor's 1911 publication of *The Principles of Scientific Management,* which furthered the development of hierarchical organizations focused on labor specialization and efficiency. Taylor's philosophy emphasized efficiency, determining the one best way to solve a problem, whether it was product manufacturing or military planning. By the onset of WWI, U.S. industry and government widely accepted Taylor's philosophy.[6]

For example, when General Pershing arrived in France, also in 1917, he needed a modern organization for the American Expeditionary Forces (AEF) staff to facilitate command and control. He studied the French and British models and adopted the French model, creating functional elements for personnel, intelligence, operations, and supply, designating them G1 through G4 respectively. By the end of 1917, he extended this same staff structure down to battalion level.[7]

While based on the French staff structure, the AEF's emerging intelligence practices were markedly British.[8] The AEF G2 established two principles that defined division of collection and analytic labor: independence and interdependence.

[6] McChrystal, *Team of Teams: New Rules of Engagement for a Complex World,* 36-48 and Mind Tools, "Frederick Taylor and Scientific Management: Understanding Taylorism and Early Management Theory," Mind Tools website, https://www.mindtools.com/pages/article/newTMM_Taylor.htm (accessed January 6, 2016).

[7] Michael E. Bigelow, "A Short History of Army Intelligence," Federation of American Scientists, U.S. Army Selected Intelligence-Related Sources website, https://fas.org/irp/agency/army/short.pdf (accessed January 5, 2016), 12-17.

[8] Warner, *Rise and Fall of Intelligence,* 59.

Independence ensured units had adequate resources and personnel to produce intelligence along their own fronts. Interdependence ensured that units shared information and analysis up and down the echelons of command. In the fashion of Taylor's philosophy, each unit had an intelligence production responsibility for a specific breadth and depth of front and each of four subdivisions within the AEF G2 had responsibility for specific specialties: cryptanalysis; human collection and CI; topography, map supply, and a Sound and Flash Ranging Division; and censorship matters and propaganda.[9] By the end of WWI, the U.S., along with its Western counterparts, had codified intelligence as a military function, merging military *reconnaissance* (collection) with a reductionist approach to information management—rudimentary analysis and production.[10]

Industrial management theory and technical collection methods provided the basis for the U.S. approach to intelligence. Since the military revolution of WWI rendered nineteenth century strategy and tactics obsolete, intelligence practitioners lacked knowledge of their adversary's doctrine and tendencies. By collecting battlefield secrets, the new intelligence organizations could form hypotheses about the adversary's actions and then test those hypotheses through future collection and battlefield reports. The Western approach to intelligence analysis had an inductive character. Intelligence

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[9] Bigelow, "A Short History of Army Intelligence," 17-19.

[10] U.S. Joint Chiefs of Staff, *Department of Defense Dictionary of Military and Associated Terms,* JP 1-02, 13. "In intelligence usage, the conversion of processed information into intelligence through the integration, evaluation, analysis, and interpretation of all source data and the preparation of intelligence products in support of known or anticipated user requirements."

emerged from WWI as a craft and was moving towards becoming an established practice.[11]

## The Interwar Years and Bolshevik Revolution

Political, social, and economic realities of the post-war world shaped the Western European and U.S. intelligence capabilities developed in WWI. Britain and France were in a position of expanded responsibility, policing their empires and portions of former German, Austro-Hungarian, and Ottoman territories, while the U.S. retrenched from the war and underwent a significant reduction in military forces. In light of these new strategic realities, Western governments reviewed the effectiveness of their internal and external security organizations and underwent a period of reorganization.[12]

Concerns governing the protection of democratic liberties and the appropriateness of military intelligence collection against non-hostile sovereigns shaped policy and drove reorganization. This action resulted in a distinct separation between internal security that Western states viewed as a domestic, policing function and external security.[13] In the U.S., moral and political concern combined with economic pressure resulted in policy that withdrew navy and army intelligence from foreign collection activities, focusing it on facility and personnel defense.[14] While U.S. leaders grappled with the moral tension

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[11] Treverton and Agrell, eds., *National Intelligence Systems,* 272, 279. Treverton and Agrell define an established practice as "an experience-based model that has an extensive background in the military profession, in policing, in education, and in farming…" They warn, however, "established practice is not enough and sometimes is disastrous, especially in fields with rapidly developing technologies and expanding knowledge."
[12] Warner, *Rise and Fall of Intelligence*, 79-80.
[13] Ibid., 81.
[14] Bigelow, "A Short History of Army Intelligence," 21-23.

created by accepting intelligence as a function of the state, a new form of government with a different approach to intelligence had already unfolded a half world away.

The Bolshevik Revolution introduced a new political, social, and economic order in the form of a communist government with centralized control over the economy. When the Czar's regime collapsed in 1917, the Communist Party took control of the state's resources and was willing to employ extreme means to preserve itself. Internal security was of utmost concern within the revolutionary government. It established a vicious counterintelligence organization called the "All-Russian Extraordinary Commission for Combatting Counter-Revolution," or "Cheka" to both penetrate society and enforce obedience. Unlike the West, the Bolshevik approach to internal security combined intelligence collection and enforcement in a single organization.[15] The Soviet approach to intelligence was markedly different from Western Europe and the U.S. in that it relied heavily on, and perfected, human intelligence, combining intelligence collection, state policing, and covert action under a single, ruthless organization. As the Russians focused their efforts on protecting state secrets and guarding the regime, others turned to solving puzzles.

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[15] Warner, *Rise and Fall of Intelligence,* 70.

**Chapter 3:  Puzzle Solving:  The Marriage of Science and Intelligence**

Puzzles are the second type of intelligence problem.  A puzzle is "a problem for which there is a solution in principle, if only the right information could be found."[1]  In intelligence, puzzle solving is the intellectual process of interpreting collected information (analysis) and proposing what it means (estimation).  Puzzle solving is a deterministic process that applies to linear systems.[2]  A system is linear if its behavior can be broken into parts and compartmentalized, even if a complicated equation with many terms describes it.[3]  The traditional scientific method, based on Descartes' principles from the sixteenth century, is a puzzle solving method.[4]  The scientific method involves three steps.  First, the observer deconstructs the system to its elementary components.

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[1] Warren Fishbein and Gregory Treverton, "Making Sense of Transnational Threats,"  A Kent Center Occasional Paper posted on the Central Intelligence Agency Library page. https://www.cia.gov/library/kent-center-occasional-papers/pdf/OPV3No1.pdf (accessed December 27, 2015). 12.

[2] Jupiter Scientific, "Definitions of Important Terms in Chaos Theory," Jupiter Scientific website, http://www.jupiterscientific.org/sciinfo/chaos.html (accessed February 15, 2016).  Jupiter Scientific defines a system as a general concept.  Systems are a "set of objects that are governed by a precise set of rules." Systems are physical, ones that occur in nature, and mathematical, ones described by equations. Mathematical systems can serve as models to represent physical systems.  Theorists categorize systems as dynamical and complex with linear and nonlinear properties.  A dynamical system is "a system that evolves with time through deterministic equations….Newton's laws of motion provide the dynamics."

[3] Alan Beyerchen, "Clausewitz, Nonlinearity, and the Unpredictability of War," *International Security*, Vol. 17, No. 3 (Winter, 1992-1993), 62, http://www.jstor.org/stable/2539130 (accessed November 27, 2015).  Bayerchen explains, "For a system to be linear it must meet two simple conditions.  The first is proportionality, indicating that changes in system output are proportional to changes in system input. Such systems display what in economics is called 'constant returns to scale,' implying that small causes produce small effects, and that large causes generate large effects.  The second condition of linearity, called additivity or superposition, underlies the process of analysis.  The central concept is that the whole is equal to the sum of its parts.  This allows the problem to be broken up into smaller pieces that, once solved, can be added back together to obtain the solution to the original problem."

[4] Ludwig von Bertalanffy, "The History and Status of General Systems Theory," *The Academy of Management Journal*, Vol. 15, No. 4, General Systems Theory (Dec.,1972), 407-426, http://www.jstor.org/stable/255139 (accessed February 13, 2016), 408-409.  Descartes' second maxim, as he presented it in *Discours de la Methode*, dictates breaking every problem down "into as many separate simple elements as might be possible."  Bertalanffy notes "This…was the conceptual 'paradigm' of science from its foundation to modern laboratory work:  that is, to resolve and reduce complex phenomena into elementary parts and processes."

Second, he formulates explanations to account for the behavior and properties of each

component separately.  Third, the observer synthesizes the individual explanations into a

unified understanding of the original system.[5]  The logic used in puzzle solving is

inductive and deductive reasoning.

Deductive reasoning "refers to the process of concluding that something must be

true because it is a special case of a general principle that is known to be true."[6]  In

deductive reasoning, intelligence practitioners begin with a general idea they know to be

true, like knowledge of an adversary's doctrine or foreknowledge of his plans.[7]  The

practitioner creates a hypothesis consistent with the idea and tests it through observation

of the adversary.  Inductive reasoning, conversely, explains what might be true, given an

incomplete set of facts.  When an intelligence practitioner lacks foreknowledge of an

adversary, he must first observe the situation and then form a general idea about the

adversary.[8]

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[5] Alexander Laszlo and Stanley Krippner, "Systems Theories:  Their Origins, Foundations, and Development," published in J.S. Jordan ed., *Systems Theories and A Priori Aspects of Perception* Chapter 3, 47-74 (Amsterdam:  Elsevier Science, 1998), 14, http://terras-altas.net.br/MA-2013/statistics/Systems%20Theories/SystemsTheory-Alexander%20Laszlo%20and%20Stanley%20Krippner.pdf (accessed February 13, 2016).  Lazlo and Krippner summarize the scientific method as, "Traditionally, the scientific method of analysis has involved: (1) the deconstruction of that which is to be explained; (2) the formulation of explanations that account for the behavior or properties of the components taken separately; and (3) the synthesis of these explanations into an aggregate understanding of the whole.

[6] University of Toronto, "Deductive and Inductive Reasoning," University of Toronto Mathematics Network website, http://www.math.toronto.edu/mathnet/questionCorner/deductive.html (accessed December 8, 2015).

[7] U.S. Joint Chiefs of Staff. *Joint Operation Planning*, JP 5-0, III-11.  "Tendencies reflect the inclination to think or behave in a certain manner."

[8] University of Toronto, "Deductive and Inductive Reasoning," University of Toronto Mathematics Network website, http://www.math.toronto.edu/mathnet/questionCorner/deductive.html (accessed December 8, 2015).  Inductive reasoning is "part of the discovery process whereby the observation of special cases leads one to suspect very strongly (though not know with absolute logical certainty) that some general principle is true."

## World War II

The strategic conditions of WWII reinforced the British, U.S., and Soviet approaches to intelligence. The global theaters, large-scale use of weapons such as the bomber and submarine, and denial of access initially onto the European continent drove Britain and the U.S. to expand their technical collection capabilities. The Soviets' existing networks permitted continued exploitation of human collection in the East. Furthermore, British and U.S. distrust of the Soviets, generated through interwar politics, combined with the theater geography to reinforce the separate development of eastern and western approaches to intelligence.[9] Each of the Allies experienced technical collection advances throughout the war, but it was the introduction of a deductive scientific method to intelligence and the establishment of intelligence sharing between Britain and the U.S. that changed Western intelligence from a craft to an established practice.[10]

In June 1940, the British and U.S. militaries began sharing technical and analytic information that resulted in significant advances in collection and analysis, especially in the field of signals intelligence. Marrying science with intelligence, the combined effort cracked German and Japanese codes, named Ultra and Magic respectively, and provided highly valuable and sensitive information to strategic and operational decision makers.[11]

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[9] Warner, *Rise and Fall of Intelligence,* 89-90, 92, 114.
[10] Ibid., 93-94 and Treverton and Agrell, 265.
[11] Williamson Murray and Allan R. Millett, *A War to be Won: Fighting the Second World War* (Cambridge, MA: Harvard University Press, 2000), 189-190, 328-329.

Through experiences such as these, science and intelligence became inseparable. However, the marriage was not without setbacks.

Inebriated by the highly sensitive information provided by Ultra and Magic, commanders and their intelligence officers were quick to believe what the Germans and Japanese were unwittingly telling them, occasionally with terrible consequences when enemy commanders did not follow script or improvised in combat. Such was the case at Kasserine Pass in February 1943, when U.S. forces, green to combat, placed too much emphasis on Ultra information and failed to patrol properly, resulting in Rommel gutting them completely, exacting twenty percent casualties in the process.[12]

WWII was the codification of intelligence. At its end, two intelligence superpowers existed: the Anglo-U.S. alliance with a technical intelligence superiority and the USSR with a human intelligence superiority.[13] The maturation of collection capabilities, introduction of a scientific approach to analysis, and enduring Anglo-American partnership established procedures that elevated intelligence to a recognized practice.

**The Cold War**

The Cold War, with the introduction of nuclear weapons, created an unprecedented challenge for U.S. intelligence. It had to have the ability to inform policy to prevent nuclear war while simultaneously predicting Soviet military actions in the event of war. The political-economic struggle between the United States and its North Atlantic Treaty

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[12] Rick Atkinson, *An Army At Dawn: The War in North Africa, 1942-1942* (New York: Henry Holt and Company, 2002), 399.
[13] Warner, *Rise and Fall of Intelligence,* 123-124.

Organization (NATO) partners against the USSR and their Warsaw Pact partners framed

U.S. international relations in the Cold War era. States emerging from the post-colonial

empires and states redefined through the conflict termination of WWII formed a new

arena for the contest of the two superpowers in a new Great Game.[14]

The ideological tension between the U.S. and the USSR defined the bipolar

character of the international community. Bounding the tension between the superpowers

was an uneasy standoff between nuclear-equipped conventional forces. Capital weapons

platforms, such as the aircraft carriers, submarines, strategic bombers, intercontinental

ballistic missiles, and armored ground forces were the strategic military assets. Each of

these systems produced unique technical signatures, leading to a reliance on technical

collection methods and capability-based analysis.[15]

To inform national strategy and operational campaign planning, the U.S. developed

an intelligence architecture that provided indirect estimates of Soviet intent based on

knowledge of Soviet doctrine, equipment capabilities, and force disposition. The USSR

and Warsaw Pact presented a significant challenge for traditional human intelligence

methods and WWII-era signals intelligence capabilities because of its closed borders and

immensely capable internal security forces.[16] However, the Soviet military's capital

platforms produced technical signatures, which when pieced together with information

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[14] Parker, ed., *Cambridge Illustrated History: Warfare*, 340-342.
[15] Wayne Michael Hall and Gary Citrenbaum, *Intelligence Analysis: How to Think in Complex Environments* (Santa Barbara, CA: Praeger Security International, 2010), 186. Technical analysis is "gaining knowledge, understanding, and insight about the technical aspects of particular events, situations, and transactions."
[16] Warner, *Rise and Fall of Intelligence,* 134.

regarding system capability and Soviet operational doctrine, provided insight into Soviet intent. Therefore, the U.S. developed a capabilities-based approach to intelligence estimates. The purpose of intelligence collection was to monitor the adversary's strategic military capabilities and, through deduction, analysts discerned the adversary's intent.[17] As an intellectual process, intelligence analysis depended on understanding the adversary's routine in order to identify deviations from the norm.

The investment in national collection systems also drove the development of centralized estimates such as the National Intelligence Estimate (NIE) to inform strategic and operational leaders of the adversary's strategic intent.[18] The requirements derived from employing national collection assets, processed by national level analytic organizations drove a top down information flow. The techniques, actions, and processes resulted in an intelligence doctrine where the combatant command staff was reliant on strategic intent estimates provided by national-level partners within the IC, a process not unlike the dissemination and control of Ultra information in WWII that led to the debacle at Kasserine Pass.[19]

In a nuanced way, intelligence shifted from puzzle solving to puzzle confirming because of the Soviets' rigid adherence to doctrine and tactics.[20] For example, in 1981 as part of the AirLand Battle concept, the Army developed a detailed procedure known as

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[17] Ibid., 150-154.

[18] Nye, "Peering into the Future," 83.

[19] U.S. Joint Chiefs of Staff, *Joint Intelligence,* Joint Publication 2-0 (Washington, D.C.: Joint Chiefs of Staff, October 22, 2013), IV-1.

[20] William Agrell, "Intelligence Analysis after the Cold War: New Paradigm or Old Anomalies?" in Treverton and Agrell, eds., *National Intelligence Systems: Current Research and Future Prospects*, 95-97.

Intelligence Preparation of the Battlefield (IPB) that prescribed how analysts would draw from doctrine to hypothesize about a Soviet encounter. The purpose of IPB was to enable an attack deep into a Soviet formation's second echelon.[21] The procedure relied on a high confidence in U.S. understanding of Soviet doctrine and a high confidence the Soviets would adhere to their doctrine.

Through the IPB procedure, analysts drew doctrinal templates from Field Manual 100-2-1, titled "The Soviet Army: Operations and Tactics," and applied them to their tactical scenario.[22] The only thinking the analyst had to do was adjust the doctrinal template to account for the irregularities of terrain. Analysts had the picture of the puzzle completed for them. Collection centered on confirming the truth—that the Soviet forces were in fact where the analysts expected them to be, in the formation the analysts expected them to be in, and moving at the doctrinal rate.

Based on experience from WWI through the Cold War, Western intelligence had developed analytic techniques based on deductive reasoning organized through reductionist divisions of labor. The U.S. approach to intelligence analysis centered on the concept of determining a solution to a linear system by applying a traditional, deductive scientific method of analysis.[23] Analysts could linearize the system in their

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[21] John L. Romjue, "The Evolution of the AirLand Battle Concept," *Air University Review,* May-June 1984, http://www.airpower.maxwell.af.mil/airchronicles/aureview/1984/may-jun/romjue.html (accessed February 7, 2016), no page.

[22] U.S. Department of the Army, *The Soviet Army: Operations and Tactics,* Field Manual 100-2-1 (Washington, DC: Department of the Army, July 16, 1984), 5-1 to 5-40.

[23] Laszlo and Krippner, "Systems Theories: Their Origins, Foundations, and Development," http://terras-altas.net.br/MA-2013/statistics/Systems%20Theories/SystemsTheory-Alexander%20Laszlo%20and%20Stanley%20Krippner.pdf (accessed February 13, 2016), 14.

approximations because of the limited number of relevant actors in the system and the

tempo of system interdependencies.[24]  An additional significant contributing factor that

supported linearizing the system was the Soviet's adherence to doctrine and procedure.

The Soviets' routine drove a Western intelligence practice that confirmed expectations

over identifying change.[25]  The collapse of the Soviet Union and Warsaw Pact shattered

the bi-polar structure and vastly complicated the intelligence estimate process.  This

approach is intellectually incompatible with characteristics of twenty-first century

conflict.

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[24] McChrystal, *Team of Teams:  New Rules of Engagement for a Complex World,* 70, and Jupiter Scientific, "Definitions of Important Terms in Chaos Theory."  Linearizing a system is approximating a nonlinear system through the application of linear system model.
[25] Agrell, "Intelligence Analysis after the Cold War:  New Paradigm or Old Anomalies?" in Treverton and Agrell, eds., *National Intelligence Systems: Current Research and Future Prospects,* 94-97.

**Chapter 4:  Mystery Resolution:  Recognizing Complexity in the Environment**

Mysteries are the third type of intelligence problem.  A mystery is an abstract

problem "to which no one can be sure of the answer."[1]  Described another way:

> A mystery, by contrast (to a puzzle), is a problem for which there can be
> several outcomes depending upon how the underlying driving forces
> combine….Mysteries are questions without a certain answer, even in
> principle, because they are future and contingent.  Collection is less crucial
> in this realm because information can only provide clues as to the likelihood
> of outcomes, not a definitive answer.[2]

Mysteries, unlike puzzles, do not have a solution that results from piecing the right

information together.  Mysteries are resolved, not solved.  Mysteries require a different

intelligence approach, one focused on understanding the interdependencies within a

system, not one focused on explaining component capabilities through the reduction of

the system.  To resolve a mystery, one must conceptualize the dynamics of the system as

a whole—an abstraction, not a deduction.  To resolve mysteries, the intelligence focus

must change from estimating and predicting to understanding and explaining.  Many of

the operational problems JFCs face today are mysteries.

### The Emergence of a Multi-Polar, Globalized Operational Environment

The dissolution of the Cold War bi-polar political environment, the rise of

economic globalization, the introduction of information globalization (especially social

media), and the emergence of transnational, non-state actors define the strategic

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[1] Nye, "Peering into the Future," 88.
[2] Fishbein and Treverton, "Making Sense of Transnational Threats," 12.

environment from the end of the Cold War through today.[3]  The increase in

interconnectedness emerging from the globalization of information and economics,

combined with the horde of political actors emerging from multi-polarity, increased the

degree and tempo of the environment exponentially.  Under these conditions, the

twentieth century conceptual approach to intelligence faltered.

With the exception of the U.S. operations against Iraq in the Gulf War and the

opening campaign of Operation Iraqi Freedom, U.S. military operations after the collapse

of the Soviet Union did not conform to traditional versions of state-on-state conventional

warfare.[4]  These "not-war" activities, especially operations in Iraq and Afghanistan,

presented ill-defined problems.  Early applications of traditional, doctrinal methods in

this highly complex environment frustrated U.S. commanders, as General Stanley

McChrystal reflected:

> In the Task Force, as in most large organizations, our actions were the
> product of our planning, our planning was predicated on our ability to
> predict….But by 2004 our battlefield behaved a lot more like the capricious
> movements of a cold front than like the steady trajectory of Halley's
> Comet….These events and actors were not only more interdependent than
> in previous wars, they were also faster.[5]

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[3] Scott M. Bowman, "Shifting Perspectives:  Using Complexity Theory to Anticipate Strategic Surprise,"
JAWS Masters Thesis (Norfolk, VA:  Joint Forces Staff College, 2015), 8-13.
[4] John P. Coles, "Full Spectrum Intelligence Support for the Joint Commander: Incorporating Cultural
Intelligence into Joint Doctrine," a paper submitted to the Department of National Security Decision
Making, Naval War College, 2005.  Defense Technical Information Center database.
http://www.dtic.mil/dtic/tr/fulltext/u2/a464552.pdf (September 3, 2015); and Hall and Citrenbaum,
*Intelligence Analysis: How to Think in Complex Environments,* 1-3.
[5] McChrystal, *Team of Teams:  New Rules of Engagement for a Complex World,* 59.

General McChrystal was experiencing not only an increase in the complexity of the environment, but also a shift in the type of problem he faced. The ill-defined problem he faced was a mystery, not a puzzle.

## A New Way of Thinking

Shifts in the strategic environment profoundly changed how the United States employs its means of national power, particularly military power. Today, U.S. strategic policy does not provide a singular focus as U.S. leadership grapples with the emergence of multiple competing opportunities and threats in a multi-polar world.[6] Many of these competitors conduct activities below the U.S. threshold for major conflict, or a NATO Article V threshold. This new battlespace is a "gray zone" between peace and war. Here nations and non-state entities achieve wartime-like objectives, such as Russian influence in the Ukraine and China's political maneuvering in the South China Sea, but often without going to war.[7]

This change in military power employment is already emerging in theater campaign plans. U.S. Africa Command's five-year plan, for example, includes efforts to neutralize the terror group al-Shabab in Somalia, contain instability in Libya, contain Boko Haram in West Africa, disrupt illicit activity in the Gulf of Guinea and in Central Africa, and

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[6] U.S. President, *National Security Strategy* (Washington DC: Government Printing Office, February 2015), 1. The NSS lists the potential proliferation of weapons of mass destruction, violent extremist organizations such as al-Qa'ida and ISIL, fragile and conflict-affected states, infectious disease, illicit weapons and drug smugglers, and destabilizing refugee flows as threats to U.S. national interests.
[7] Peter Pomerantsev, "Brave New War," *The Atlantic,* December 29, 2015, http://www.theatlantic.com/international/archive/2015/12/war-2015-china-russia-isis/422085/ (accessed December 30, 2015).

build African partners' peacekeeping and disaster assistance capabilities.[8]  Most of these

activities fall outside the scope of military planners' expertise.  The U.S. Joint Staff is

developing new concepts and methods of campaigning specifically to address the

increase in "gray zone" activity.[9]  These new campaign concepts need a corresponding

concept and method for intelligence.  Intelligence for this type of military campaign must

center on a conceptual framework that is fundamentally different from the Cold War

intelligence collection and analysis framework.  "Neither reorganization nor analytic

training is a sufficient answer."[10]  It requires a conceptual framework designed to

understand mysteries, not solve puzzles.  It requires an understanding of three interrelated

theories: General Systems Theory (GST), complexity theory, and game theory.

General Systems Theory originated in the 1920s when Ludwig von Bertalanffy, an

Austrian biologist, proposed that a living thing's fundamental character is its

organization.  Therefore, "the customary investigation of the single parts and processes

(of an organism) cannot provide a complete explanation of the vital phenomena."[11]  His

argument moved the idea that the whole of a system is greater than the sum of its parts

from philosophy to science.  The scientific community was hesitant to adopt

Bertalanffy's proposal because his statement implied that science required a new

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[8] Jim Garamone, "AFRICOM Campaign Plan Targets Terror Groups," DoD News, Defense Media Activity, http://www.defense.gov/News-Article-View/Article/639919/africom-campaign-plan-targets-terror-groups (accessed January 6, 2016.)
[9] Anulio J. Echevarria, "How Should We Think About "Gray-Zone" Wars?" *Infinity Journal*, Volume 5, Issue 1, https://www.infinityjournal.com/article/158/How_Should_We_Think_about_GrayZone_Wars/ (accessed January 7, 2016).
[10] Agrell, "Intelligence Analysis after the Cold War:  New Paradigm or Old Anomalies?" in Treverton and Agrell, eds., *National Intelligence Systems: Current Research and Future Prospects* 93.
[11] Bertalanffy, "The History and Status of General Systems Theory," 410.

epistemology.  The scientific method of the period centered on two fundamental

principles: unidirectional causality and the reduction of systems to their most elementary

components.  Bertalanffy proposed a paradigm that required multi-directional causality

and wholeness—the ensemble of parts and their relationships.

GST explains how systems work through the study of two subfields: closed systems

and open systems.  The study of closed systems assumes "the main features of an

organization are its internal elements," whereas an open system assumes "the

organizations' interaction with the external environment (is) vital for organizational

survival and success."[12]  As GST developed through the 1960s and 1970s, its proponents

and the proponents for the fields of cybernetics and system dynamics identified

commonalities between the three.  By 1977, theorists referred to the overarching

constructs of the three as the *theories of complexity*.  By 1990, the three branches merged

under complexity theory.[13]  It is important to note that complexity theory accounts for a

broad category of studies.  It is not a unified theory.  Currently, some theorists argue that

GST "is preoccupied with 'problem solving' or confirmatory analysis and has a critical

interpretivist bent to it, whereas complexity theory is exploratory and positivist."[14]

Therefore, some professionals distinguish GST within complexity theory.

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[12] Francis Amagoh, "Perspectives on Organizational Change:  Systems and Complexity Theories," *The Innovation Journal: The Public Sector Innovation Journal*, Volume 13(3), 2008, article 3, http://www.innovation.cc/peer-reviewed/amagoh3dec2008jag2rev1.pdf (accessed February 13, 2016), 2.
[13] Ralph H. Abraham, "The Genesis of Complexity," http://www.ralph-abraham.org/articles/MS%23108.Complex/complex.pdf (accessed February 13, 2016).
[14] Kurt A. Richardson, "Systems Theory and Complexity: Part 1," *E:CO*, Issue Vol. 6 No. 3 2004 pp. 75-79 http://www.kurtrichardson.com/Publications/ECO/ECO_other/Issue_6_3_10_FM.pdf (accessed February 13, 2016), 75.

## Complexity Theory

Complexity theory explains system phenomena by approaching the study from a wholeness perspective.[15]  However, the characteristics of a complex system set the broader complexity theory apart from GST.  In addition to interdependence and feedback, considered in GST, complexity theory categorizes complex systems as ones that spontaneously self-organize, demonstrate emergence, and are adaptive.  They are inherently non-linear and therefore irreducible.[16]  Non-linear systems demonstrate specific characteristics that render traditional puzzle-solving methods useless.

> Nonlinear systems are those that disobey proportionality or additivity.  They may exhibit erratic behavior through disproportionately large or disproportionately small outputs, or they may involve 'synergistic' interactions in which the whole is not equal to the sum of the parts….If interactions are irreducible features of the system, however, it is nonlinear even if described by relatively simple equations.[17]

Complexity in the operational environment is not a new phenomenon.  The two World Wars and the Cold War were complex.[18]  The degree of complexity and the tempo of interactions were less, which presented linear-like characteristics when analysts studied discrete puzzles bound by a shallow temporal window.  The lack of tempo and

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[15] Bowman, "Shifting Perspectives:  Using Complexity Theory to Anticipate Strategic Surprise," 24.

[16] M. Mitchell Waldrop, *Complexity:  The Emerging Science at the Edge of Order and Chaos* (New York: Touchstone, 1992), 11-12, 60-61, 64-66, 329.

[17] Beyerchen, "Clausewitz, Nonlinearity, and the Unpredictability of War," 62.

[18] Dwight D. Eisenhower, *Crusade in Europe* (Baltimore:  Johns Hopkins University Press, 1948), 74. Eisenhower notes that battle areas extended to over hundreds of miles of front and depth.  Coexisting in this space were combat forces and civilian populations, who expressed varying degrees of hostility and civility towards the Allies.  He emphasizes the interplay between the air, ground, and maritime domains and associated control requirements that were driving staff organization to an unprecedented size.  Additionally, he notes the interconnectedness of military actions with the political direction of the supporting nations and will of their peoples.

lesser degree of complexity in the environment allowed the application of linear

regression techniques to forecast patterns and trends towards future activity with relative

accuracy.  However, as General McChrystal realized later in Iraq, "Attempts to control

complex systems by using the kind of mechanical, reductionist thinking championed by

thinkers from Newton to Taylor...tend to be pointless at best or destructive at worst."[19]

While GST and complexity theory describe systems, they do little to help analysts

understand the decisions actors make within these systems.  A third field of study under

the broad category of complexity theory is a body of knowledge that focuses on the

decisions people make in competition—game theory.

### Game Theory

Political interaction, whether between states or between a state and a non-state

entity, is a "game" in a theoretical sense.  Military conflict is one of many forms of

political interaction.  Game theory is the study of decision making by actors with

conflicts of interest within competitive activities under conditions of certainty, risk, and

uncertainty.[20]  It presents a model known as the n-person, non-zero sum, non-cooperative

game that explains the competitive interdependent modern world.[21]  From a game theory

perspective, war is an n-person game, because rarely does a war include only two

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[19] McChrystal, *Team of Teams:  New Rules of Engagement for a Complex World,* 68.
[20] Luce and Raiffa, *Games and Decisions: Introduction to Critical Survey*, 1, 3-6, 13.
[21] Paul Walker, "A Chronology of Game Theory," University of Canterbury, New Zealand website, entry posted September 2012, http://www.econ.canterbury.ac.nz/personal_pages/paul_walker/gt/hist.htm (accessed October 14, 2015); Don Ross, "Game Theory," *The Stanford Encyclopedia of Philosophy* (Winter 2014 Edition); Edward N. Zalta (ed.) http://plato.stanford.edu/archives/win2014/entries/game-theory/ (accessed October 14, 2015); Luce and Raiffa. *Games and Decisions: Introduction to Critical Survey*, 177-179.

competitors.  War is a non-zero sum game because although each side has a political objective at the onset, the process of executing the conflict develops options to end the game short of achieving the political objective, but more favorable than continuing the fight.  War is non-cooperative by its very nature.  To win, competitors cooperate with allies to maximize political will and mass resources.  Competitors also collude to deny adversaries information and resources.

To resolve mysteries, the joint function of intelligence must apply a cognitive approach that leverages modern understanding of competition in complexity.  The existing intelligence doctrine acknowledges the interconnectedness of the operational environment.  However, its foundational principles still adhere to a reductionist scientific method of a bygone era to solve puzzles.

## Chapter 5:  Estimating and Understanding

The U.S. Joint Operational Planning Process (JOPP) centers on a six-phase

campaign model designed to counter a near peer, or state-like, adversary in conventional

military conflict.  Currently, the Strategic Landpower Task Force is developing a

campaign concept known as the Joint Concept for Integrated Campaigning (JCIC) to

provide a conceptual approach that better accounts for campaign design "in the uncertain

and gray conditions between peace and war."[1]  The Strategic Landpower Task Force

argues that the existing U.S. campaign model is not ideally suited to modern campaign

requirements.  The Task Force reasons that the existing approach fails to "counter and

defeat adversary approaches characterized by episodic and continual confrontations of

narrative, cyber intrusion, influence actions, and ambiguous force without sustained

conflict."[2]  To be effective, the JCIC requires a supporting concept for intelligence

underpinned by a contemporary understanding of competition in complexity.  The

existing joint intelligence model falls short.

### Estimating What:  The Joint Intelligence Planning Model

The joint function of intelligence supports JOPP through the Joint Intelligence

Preparation of the Environment (JIPOE) process.  The product from the JIPOE process is

the intelligence estimate.  The purpose of the intelligence estimate is to describe the

critical aspects of the operational environment and provide a prioritized set of anticipated

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[1] Strategic Landpower Task Force, "Future Joint Force Concepts Focus on Human Elements."
[2] Strategic Landpower Task Force, "Joint Concept for Integrated Campaigning: Executive Overview Brief,"
Unpublished PowerPoint briefing dated October 24, 2015, 2, 11, 15.

adversary courses of action for the Joint Force Commander's (JFC) decision-making process.[3]  It rests on a premise that the intelligence staff can estimate an adversary's future action through the decomposition, recomposition, and synthesis of the components and systems within the OE.[4]  This estimate forms the understanding of the environment for joint force staff campaign planning.[5]

The four-step JIPOE process is adversary centric, but does account for multiple conditions and actors within the environment.[6]  It is a puzzle-solving process resulting from the U.S. military's experiences from WWI through the Cold War.  First, the joint force staff limits the scope of analysis by defining the area of operations and area of interest based off the joint force mission.  Analysts then deconstruct the OE through "a **cursory** examination of each aspect of the OE in order to identify those characteristics of **possible** significance or relevance to the joint force and its mission (emphasis in original)."[7]  Second, analysts further deconstruct the OE into physical areas and nonphysical aspects, categorizing subordinate systems as the land domain, maritime domain, air domain, space domain, and information environment.  Joint doctrine prescribes further subdividing domain into several series of subcategories until analysts

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[3] U.S. Joint Chiefs of Staff, *Joint Intelligence Preparation of the Operational Environment*, Joint Publication 2-01.3 (Washington, D.C.: Joint Chiefs of Staff, May 21, 2014), VI-1.
[4] Hall and Citrenbaum, *Intelligence Analysis,* 77, 299, and 314; and U.S. Joint Chiefs of Staff, *Department of Defense Dictionary of Military and Associated Terms,* JP1-02, s.v. "synthesis."  Decomposition is "breaking a thought or activity into basic elements to discern meaning or facilitate a more complete understanding."  Recomposition is "human and machine-driven recompilation of collected data to gain information, knowledge, and understanding."  Hall defines synthesis as "the human cognitive activity that combines elements of substances, events, activities, or energy to form a coherent whole."  However, DoD defines synthesis as, "In intelligence usage, the examining and combining of processed information with other information and intelligence for final interpretation."
[5] U.S. Joint Chiefs of Staff, *Joint Intelligence Preparation of the Operational Environment*, JP 2-01.3, I-1.
[6] Ibid., III-38.
[7] Ibid., II-3.

have categorized discrete actors, characteristics, and systems within the OE.[8]  Once

analysts have subcategorized and isolated the components of the OE, joint doctrine

prescribes developing understanding through a systems perspective centered on the

Political, Military, Economic, Social, Information, and Infrastructure (PMESII) model.

The purpose of conducting the PMESII systems analysis is to provide "an

understanding of significant relationships and interdependencies within and between

interrelated…systems relevant to a specific joint operation and...the commander's

specified focus area."[9]  Analysts identify relationships and interdependencies through

decomposition, link analysis, recomposition, and synthesis.[10]  The joint staff intelligence

directorate (J2) integrates the component and systems analysis into an estimate of

environmental effects on the joint force, adversary, and other actor's potential courses of

action and provides a preliminary prioritization of broad adversary courses of action.

The third step of JIPOE is the evaluation of the adversary and other relevant actors.

The purpose of the third step is to develop models "that portray how adversary forces

normally execute military operations or how they have reacted to specific military

situations in the past" by analyzing the adversary's doctrine (or observed patterns of

operation), equipment capabilities, and composition and disposition of forces.  It is the

direct application of Descartes' scientific method focused on estimating the adversary's

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[8] Ibid., III-2 to III-33.

[9] Ibid., I-4.

[10] Hall and Citrenbaum, *Intelligence Analysis,* 121.  Link analysis is "gaining understanding and insights into behavioral or functional relationships, means of communicating and being connected, and how connections and relationships work between and among people, organizations, internal network nodes, and among networks."

intent based on component capabilities. Paramount to this step is a "center of gravity" analysis—essentially a systems synthesis fixated on determining a single critical node, or set of nodes and links, upon which the adversary's strength depends.[11] This equates to the scientific method of synthesizing component explanations into a unified understanding of the original system.

The fourth step of JIPOE is deductive and predictive in nature. In this step, the J2 staff develops "a detailed understanding of the adversary's probable intent and future strategy."[12] To develop these anticipatory estimates, the J2 analysts utilize a conceptual approach based on deductive reasoning using the cognitive tools of pattern analysis, trend analysis, and technical analysis.[13] Experienced analysts may also use anticipatory analysis.[14] Beginning with the models of adversary behavior thought to be true (theory), analysts develop a hypothesis about the adversary's (and other relevant actors) strategy, likely objectives, and desired end state. The JIPOE process is ideal for analyzing a complicated environment through a systems analysis approach.[15]

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[11] Ibid., IV-1 to IV-14.

[12] Ibid., V-1.

[13] Hall and Citrenbaum, *Intelligence Analysis,* 139, 155. Pattern analysis is "discerning a consistent series of actions or events." Trend analysis is "discerning meaning from technical, cultural, and function-oriented events, interactions, transactions, behaviors, or activities that occurred in the past to understand how similar events or activities could happen in the future."

[14] Ibid., 167. Anticipatory analysis is "using thought, intuition, foreknowledge, knowledge, experience, or prescience to realize in advance what the adversary or competitor might do and testing, confirming, or denying that hypothesis or postulate."

[15] U.S. Joint Chiefs of Staff, *Joint Intelligence Preparation of the Operational Environment*, JP 2-01.3, III-43.

## JIPOE Strengths

The Joint Force intelligence doctrine holds certain time-tested methods that the Joint Staff should retain. First, the Joint Force should not discard deduction as a form of logical reasoning, but include it as part of a set of logical reasoning skills. When facing a state based threat, as analysts faced in the Cold War, the Intelligence Community (IC) has the time to develop adversary models based on observations of that adversary's activities and determine the degree of rigidity with which that adversary adheres to its doctrine.

Second, joint doctrine includes effective tools to inform understanding of emerging adversaries.[16] Used with inductive logical reasoning, analysts can use observations (patterns, links, and associations) to form a hypothesis about the adversary's tendencies and preferred tactics, techniques, and procedures or the tendencies of other actors. Analysts can then test these hypotheses through further observation and reactions to joint force operations.

Third, the analytic techniques of decomposition, link analysis, pattern analysis, trend analysis, technical analysis, anticipatory analysis, recomposition, and synthesis apply in complex environments. Analysts can use these techniques to explain activities that have happened, which informs an understanding of how the system has behaved or is behaving. However, analysts should not use these tools to linearize the system for forecasting purposes.

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[16] Ibid., E-1 to E-12.

## JIPOE Weaknesses

Joint intelligence doctrine has four critical weaknesses directly linked to its development as a secret-finding, puzzle-solving process. First, it does not provide the theory (conceptual approach) to understand a multi-actor competition unfolding in a complex environment.[17] The existing conceptual approach to intelligence centers on scientific theory that holds the sum of a system's parts equal to its whole; therefore, study of components leads to understanding of the system. This approach is inconsistent with contemporary understanding of complex systems. It discounts the dynamics of the system generated from interactions between components and subsequent synergy of the system.

Second, joint doctrine assumes that linearized systems models will accurately approximate the real system. The increase in interconnectedness realized since the end of the Cold War makes this assumption unlikely. Joint doctrine presumes simplicity in the adversary network. For example, a Center of Gravity (COG) may or may not exist. Joint doctrine defines a COG as "the source of power that provides moral or physical strength, freedom of action, and will to act." It is important to note that this definition differs from other service and classical definitions, but the central idea remains the same, that the adversary system is simple in form having one critical point that if affected directly or indirectly will result in the collapse of the adversary's strategy.[18] Joint doctrine expounds

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[17] Bowman, "Shifting Perspectives: Using Complexity Theory to Anticipate Strategic Surprise," 22-23, 43.

[18] Antulio Echevarria, *"Clausewitz's Center Of Gravity: It's Not What We Thought," Naval War College Review,* Volume 56, Number 1 (Winter 2003*),* 108-123, https://www.usnwc.edu/getattachment/d863be95-597d-4220-8cb6-169c80ca1f6b/Clausewitz-s-Center-of-Gravity--It-s-Not-What-We-T (accessed February 14, 2016), 108-110.

that a COG is rarely a single node, but a "set of nodes and their respective links." As a system's interconnectedness grows, the system becomes more resilient, eliminating single paths between nodes. If a node or set of nodes disconnect from the system, the system reroutes around the interference. This is the essence of self-organization and adaptability.[19] Analysts could be looking for a lynchpin that is simply not in the structure.

Third, joint doctrine does not employ cognitive skills suited to understand a complex environment.[20] Through deductive logic, the analyst is confirming expected behavior based on a theory (or adversary doctrine) held to be true rather than interpreting and explaining the adversary. Robert Mandel, professor of International Affairs at Lewis and Clark College notes that, "after the fall of the Soviet Union continued reliance on the Cold War intelligence paradigm permitted serious analytic shortfalls to develop in the face of evolving post-Cold War national security challenges."[21] Unlike the Cold War, well-developed models do not exist for the adversaries most proliferate in the twenty-first century—terrorists in Afghanistan, insurgents in Iraq, and Violent Extremist Organizations such as ISIL. Against emerging, adaptive adversaries, analysts must use an inductive approach to explain adversary behavior.

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[19] Waldrop, *"Complexity: The Emerging Science at the Edge of Order and Chaos,"* 11.
[20] Flynn, Pottinger, and Batchelor, "Fixing Intel: A Blueprint for Making Intelligence Relevant in Afghanistan," 7, 9.
[21] Robert Mandel, "On Estimating Post-Cold War Enemy Intentions," *Intelligence and National Security*, Volume 24, Issue 2 (April 2009): 194-215. https://web-a-ebscohost-com.nduezproxy.idm.oclc.org/ehost/detail/detail?sid=b28a3844-1994-4ee2-8de5-420994ce752d%40sessionmgr4004&vid=26&hid=4104&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#AN=40627139&db=tsh (accessed September 16, 2015), 195.

The JIPOE is ultimately a predictive process, but predicting the outcomes of a complex system is a fool's errand. Complex systems are irreducible and nonlinear, the opposite characteristics from those required for linear regression. An inherent characteristic of complex adaptive systems is anticipation.[22] Joint doctrine captures a simple example of anticipation and adaptation in the paradox of warning.[23] The paradox is a continuous action, warning, counteraction cycle. It demonstrates that if a friendly force discerns an adversary's intent and takes action to preempt the adversary, then the adversary changes his intent and course of action if the adversary discovers the friendly force preemption. It is easy to imagine the dynamics of a complex adaptive system if one extrapolates the paradox of warning to an environment with multiple actors competing simultaneously. Determining the specific future action of any one actor with any confidence is fraught with difficulties. Although it is theoretically possible to normalize portions of the nonlinear system to linear approximates, it is *practically* impossible.[24]

Finally, the intelligence estimate model rests on the assumption that national-level intelligence organizations, who historically have the responsibility of maintaining strategic adversary intent estimates, would receive adequate indications and warning to initiate the joint planning process.[25] In this context, the J2 at a combatant command is responsible for developing operational intelligence estimates of adversary intentions based on national-level strategic intent estimates. This echoes the division of labor

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[22] Luce and Raiffa, *Games and Decisions: Introduction to Critical Survey*, 146-147.
[23] U.S. Joint Chiefs of Staff, *Joint Intelligence*, JP 2-0, I-28 and Figure I-8.
[24] McChrystal, *Team of Teams: New Rules of Engagement for a Complex World,* 59.
[25] U.S. Joint Chiefs of Staff, *Joint Intelligence*, Joint Publication 2-0, IV-1.

emplaced during WWI and reinforced through the Cold War. Today's theater J2 must maintain strategic intent estimates of the regional actors to understand the interconnectedness within his region.

Adversary *intentions* in this context are distinctive from the adversary's *strategic intent*. The adversary's strategic intent includes his political objective, strategy, and an assessment of the degree of commitment the adversary has to achieve that objective. At the combatant command, or operational level, the J2 currently focuses his estimate on what the adversary *might due* (his intentions) given the adversary's capabilities—what he *could do*.[26] This technique is associated with two analytic fallacies. The first is the fallacy of employing worst-case thinking in adversary intent estimates and the second is analyzing only capabilities rather than intentions in threat estimates. These related fallacies generally result in estimates that maximize the adversary's use of all capabilities whether or not the adversary has any intent to employ them.[27]

The U.S. approach to intelligence must change to account for the known characteristics of complex systems, especially nonlinearity and interdependency. Shifts in the tempo and number of interconnected political, social, and economic systems within the strategic environmental have increased its degree of complexity rendering previous linear estimation techniques inapplicable. The conceptual approach must shift from

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[26] U.S. Joint Chiefs of Staff, *Joint Intelligence*, Joint Publication 2-0, IV-1; U.S. Joint Chiefs of Staff, *Joint Intelligence Preparation of the Operational Environment*, JP 2-01.3, I-19.
[27] Mandel, "On Estimating Post-Cold War Enemy Intentions," 197-201.

trying to estimate what a single adversary might do to understanding why their complex system has multiple possible outcomes.

### Understanding Why:  A Different Conceptual Approach to Intelligence

Three adaptations to the Joint Force approach to intelligence are required to keep intelligence relevant in the contemporary environment.  First, intelligence must ground its conceptual approach in theory that accounts for the characteristics of complex environments, not in the archaic scientific methods of Descartes and Newton.  Second, it must shift from a reliance on a deductive cognitive method to one inclusive of inductive and abductive methods.  Third, intelligence must retain existing analytic techniques, but broaden analysts' skillsets to include advanced analytic techniques and apply these techniques in a manner logically consistent with the characteristics of complex systems.

Shifting the intelligence approach from *what* an adversary is doing and estimating *what* that adversary will do next to *why* an adversary or operational problem has emerged is a significant shift from the direction of over 100 years of intelligence development. However, it is the fundamental difference between solving puzzles and resolving mysteries.  Intelligence professionals must understand and apply theories such as GST, complexity theory, and game theory in a manner that is logically consistent with the known characteristics of complex systems and the dynamics of competitions with multiple, non-cooperative actors.[28]

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[28] Bowman, "Shifting Perspectives:  Using Complexity Theory to Anticipate Strategic Surprise," 2, 32. Bowman argues, "Today's standard analytical tradecraft, while still useful, is not sufficient to produce timely warning about world events.  Analysts must broaden their understanding of the interconnectedness and changing landscape of the increasingly complex post-Cold War strategic environment."

Applying game theory to military decision making is not new. Military professionals argued for the application of game theory and capability-based adversary intent modeling to military decision making over fifty years ago and underlying tones from those arguments reside in existing doctrine.[29] However, those arguments focused on binary conflicts—two person, zero sum games and capabilities-based adversary intent estimates that were logically consistent with the principles of Descartes' scientific method.

In 1954, for example, Colonel Oliver Haywood proposed the use of a two-person, zero-sum game and capabilities-based adversary intent estimate to inform commander's decisions utilizing the Battle of the Bismark Sea as a model. Haywood explained General Kenny's decision process given the capabilities of the Japanese fleet and each commander's orientation on security maximization.[30] Since both commanders were applying the same logic, they reached an equilibrium pair, which Kenny exploited resulting in devastating losses of troop and supply convoys for the Japanese. Arguments such as this shaped the development of doctrine. Course of action analysis remains a two-person, zero-sum game informed by a capabilities-based adversary intent estimate.

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[29] U.S. Joint Chiefs of Staff. *Joint Operation Planning*, JP 5-0, IV-27 to IV-30 and Oliver Haywood, "Military Decision and Game Theory," *Journal of the Operations Research Society* 2, NO. 4 (November 1954), 365-366 as referenced in Luce and Raiffa, *Games and Decisions: Introduction and Critical Survey,* 64. "A military commander may approach decision with either of two philosophies. He may select his course of action on the basis of his estimate of what his enemy is able to do to oppose him. Or, he may make his selection on the basis of what his estimate of what his enemy is going to do. The former is a doctrine of decision based on enemy capabilities; the latter, on enemy intentions….The doctrine of decision of the armed forces of the United States is a doctrine based on enemy capabilities….A commander is enjoined to select the course of action which offers the greatest promise of success in view of the enemy capabilities. (emphasis original).

[30] Haywood, "Military Decision and Game Theory," *Journal of the Operations Research Society* as referenced in Luce and Raiffa, *Games and Decisions: Introduction and Critical Survey,* 64.

JFCs do not enjoy the luxury of facing binary problems. The proper conceptual approach from a game theory perspective is the n-person, non-zero sum, non-cooperative game. Appendix C: A Thought Experiment provides a conceptual application of this framework to explain the Levant situation. Using an abstraction such as this to frame the environment, analysts are better postured to apply cognitive skills and analytic techniques in a manner logically consistent with the characteristics of complex environments.

The most prevalent adversary the Joint Force has faced in the twenty-first century is an emergent, adaptive threat, such as ISIL, without an existing doctrine or stable pattern to model. A modern intelligence approach must include inductive and abductive reasoning methodologies to complement intelligence's traditional deductive methodology. Deductive reasoning is absolutely the correct form of logic when working from a known to an unknown. However, deductive reasoning does not apply when one lacks all the facts or is addressing a new phenomenon. Because complex environments have emergent properties, explaining new phenomena are a constant challenge for the modern intelligence professional.

Inductive reasoning explains what might be true, given an incomplete set of facts. It is part of the discovery process and the basis of developing hypotheses. When an intelligence practitioner lacks foreknowledge of an adversary, he must first observe the situation and then form a general idea about the adversary.[31] Inductive reasoning is the intellectual process of interpreting collected information (analysis) and proposing what it

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[31] University of Toronto, "Deductive and Inductive Reasoning."

means (estimation). In puzzle solving, inductive reasoning leads to theory generation. Deductive reasoning from that generated theory follows as theory testing. However, unlike solving puzzles, resolving mysteries requires a different subsequent step of logic from inductive reasoning—abductive reasoning.

Abductive reasoning is a creative, intuitive process. It "typically begins with an incomplete set of observations and proceeds to the likeliest possible explanation for the set."[32] Medical diagnoses, broad concepts of design, and "thought experiments" are examples of abductive reasoning. Abductive reasoning is the cognitive method analysts use in advanced analytic techniques and alternative analysis.

### Advanced Analytics and Alternative Analysis

The term "analyst" is practically a misnomer in complexity, since it implies an approach reliant on deconstruction and reconstruction to gain understanding. Even through the Cold War, leaders did not value an analyst for his analysis, but for his synthesis of information. Armed with a theoretical understanding of complexity and a broader set of reasoning approaches, intelligence professionals facing complex environments require different analytic techniques beyond simple deconstructive and reconstruction and they must apply existing techniques within the context of complexity.

Advanced analytics is a "field of knowledge and a discipline of thought" that is "the high-level cognitive processes producing specific, detailed thought and understanding of

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[32] Butte College, "Tip Sheet: Deductive, Inductive, and Abductive Reasoning," Butte College website, https://www.butte.edu/departments/cas/tipsheets/thinking/reasoning.html (accessed December 8, 2015).

the OE, and knowledge superior to that possessed by the adversary."[33] Eight analytic

techniques are resident in existing joint doctrine: decomposition, link analysis, pattern

analysis, trend analysis, anticipatory analysis, technical analysis, recomposition; and

synthesis, as articulated previously. How analysts think and apply these techniques

against a complex environment is what matters. In existing doctrine, analysts apply these

techniques to understand the capabilities of adversary components and forecast adversary

courses of action. These same techniques should inform the analyst's understanding of

the interconnectedness of the environment and the dynamics occurring within that

system. These eight techniques assist the analyst in inducing theories about the

operational environment for a better understanding.

Five additional techniques move the analyst from inductive reasoning to abductive

reasoning: anomaly analysis, cultural analysis, tendency analysis, semiotics analysis, and

aggregation analysis.[34] Some intelligence professionals have argued that anomaly

analysis, like pattern analysis, while useful in studying linear systems is less useful when

studying complex systems.[35] This position reflects the existing doctrinal tendency to use

pattern and anomaly analysis for forecasting instead of understanding. Although

complex systems are nonlinear, that does not mean they are without patterns. Anomaly

analysis is "discerning meaning in departures from the normal or common order, form, or

rule; absence of that which is expected."[36] Anomaly analysis compliments pattern

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[33] Hall and Citrenbaum, *Intelligence Analysis*, 2.
[34] Ibid., 2.
[35] Bowman, *Shifting Perspectives: Using Complexity Theory to Anticipate Strategic Surprise,* 18.
[36] Hall and Citrenbaum, *Intelligence Analysis,* 218.

analysis in understanding the environment. The nonlinear nature of complex systems makes patterns important to the analyst because a small perpetration in the environment can significantly change the order of the system's patterns. These anomalies can inform the analysts understanding of the sensitivity of the system to change.

Cultural analysis is "knowing a particular culture, its people, and their patterns of behavior deriving from traditional, culturally induced attitudes, behaviors, social norms, and conditions."[37] It "provides understanding of a people or nation's history, institutions, psychology, beliefs (such as religion), and behaviors."[38] Cultural analysis provides the analyst with an understanding of why relevant actors think and behave the way they do. Without a cultural understanding, analysts are at risk of the most prevalent intelligence fallacies: mirror imaging and double mirror imaging.[39] Furthermore, cultural analysis informs an understanding of relevant actors' semiotics.

Semiotics analysis is "discerning meaning, knowledge, or understanding from cultural signs and symbols as reflected in drawings, paintings, photography, syntax, words, sounds, and body language, plus the mediums upon which they ride."[40] Semiotics provides context to what actors communicate by how they communicate. Additionally, an understanding of semiotics provides a frame through which the analyst can aggregate

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[37] Ibid., 235.

[38] John P. Coles, "Full Spectrum Intelligence Support for the Joint Commander: Incorporating Cultural Intelligence into Joint Doctrine," a paper submitted to the Department of National Security Decision Making, Naval War College, 2005, http://www.dtic.mil/dtic/tr/fulltext/u2/a464552.pdf (September 3, 2015), 3.

[39] Mandel, "On Estimating Post-Cold War Enemy Intentions," 203-205. Mirror imaging is "projecting one's own thought processes onto (adversary) intentions," whereas double mirror imaging is "denigrating (adversary) intentions by portraying them as opposite to one's own."

[40] Hall and Citrenbaum, *Intelligence Analysis,* 255.

information, remaining consistent with the culture of the relevant actor.  Semiotics, together with cultural analysis, informs tendency analysis.

Closely associated with semiotics analysis and cultural analysis is tendency analysis.  Joint planning doctrine discusses the importance of understanding actor's tendencies, but joint intelligence doctrine does not include a definition of tendency analysis or a technique for conducting it.[41]  Tendency analysis is "discerning meaning through thought and study of the general proclivities of people, the behavioral and action inclinations of organizations, mental snapshots of current environment or contextual situations, events, activities, behaviors."  It also includes "the emanation (and) dispersal of energy emissions."  Most importantly, it is the consideration of "what the interaction and enmeshing of all (of the above) could portend for the future."

In joint planning doctrine, the purpose of tendency analysis is to "identify the range of possibilities that relevant actors may develop with or without external influence."[42]  Tendency analysis relates to technical and cultural analysis.  It serves as an intermediate synthesis of three baselines: technical processes, functional actions or activities, and cultural knowledge and values to establish an understanding of actors' preference norms and behaviors.[43]  Similar to trend and anomaly analysis, tendency analysis develops the analyst's understanding of preferred actor thoughts and behavior in order to identify

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[41] U.S. Joint Chiefs of Staff. *Joint Operation Planning*, JP 5-0, III-11.  Planning doctrine states, "In developing an understanding of the interactions and relationships of relevant actors in the operational environment, commanders and staffs consider natural tendencies and potentials in their analyses.  Tendencies reflect the inclination to think or behave in a certain manner.  Tendencies are not considered deterministic but as models describing the thoughts or behaviors of relevant actors."
[42] Ibid.
[43] Hall and Citrenbaum, *Intelligence Analysis,* 211-213.

deviations from that preference. Understanding relevant actor tendencies provides a basis for understanding actors' decision criteria and the characteristics of self-organization within the system.

Similar to the operational design process, aggregation analysis is an abstract, iterative conceptual process that helps intelligence analysts frame the relevant actors within the operational environment.[44] It is the process of "discerning meaning, knowledge, or understanding of the energy and power of several things—numbering from a few to a million—that are grouped together, moving together, working together, and considered as a whole, although the parts may at times appear disassociated or disparate."[45] Whereas synthesis combines elements to form a coherent whole, aggregation considers the whole to frame relationships, bonds, and trajectories.

Aggregation analysis considers three ideas to visualize actors and their relationships. First is "glue" or the bond that holds elements of the aggregate together, such as ideologies, missions, or ethnic ties. Second is "propellant" that "provides energy and movement" to the aggregate, such as a "cause belief or emotion."[46] Third is the "igniter" or catalyst that initiates the propellant. The igniter is the most abstract aspect of the process. It is the often intangible and difficult to envision.

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[44] U.S. Joint Chiefs of Staff. Joint Operation Planning, JP 5-0, III-1. Operations design is "a process of iterative understanding and problem framing that supports commanders and staffs in their application of operational art with tools and a methodology to conceive of and construct viable approaches to operations and campaigns.

[45] Hall and Citrenbaum, *Intelligence Analysis,* 277.

[46] Ibid., 279.

Aggregate analysis can explain sudden and dramatic shifts in aggregate behavior. For example, culture and religion, among other bonds, "glue" the Afghans together as an aggregate. On February 21, 2012, riots broke out across Afghanistan and raged for five days resulting in four coalition deaths, four civilian deaths, and at least ninety-two civilians injured.[47] Prior to February 21, 2012, the Afghan population was on a relatively pacific trajectory. Word of mouth communication about coalition members burning Qurans at Bagram airfield ignited a violent and rapid change in the Afghan population's trajectory.

Not all of the advanced analytic techniques apply universally to all problem sets, but together they create a powerful toolkit for the analyst. However, without critical thinking skills, analysts risk misapplying the analytic techniques. Alternative analysis is a type of critical thinking that helps prevent falling victim to common intelligence fallacies.[48] Alternative analysis provides "tools designed to help analysts and decision makers employ rigorous self-review, question judgments, and explore alternate outcomes—to better address threats in the increasingly important realm of transnational issues."[49] Alternative analysis helps analysts think beyond conventional bounds and challenge assumptions, broadening the range of outcomes they consider. It serves as a

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[47] Nick Paton Walsh and Masoud Popalzai, "4 killed in Afghanistan amid Outrage over Quran Burning," Cable News Network (CNN) website, http://www.cnn.com/2012/02/25/world/asia/afghanistan-burned-qurans/ (accessed February 15, 2016).
[48] Hall and Citrenbaum, *Intelligence Analysis,* 93. Critical thinking is "an intellectual process that 'examines assumptions, discerns hidden values, evaluates evidence, and assesses conclusions.'"
[49] Fishbein and Treverton, "Making Sense of Transnational Threats," vii.

hedge against logic fallacies common to intelligence analysis.[50]  A form of alternative

analysis in use currently, but not widely embraced, is red teaming.  Red teams provide

commanders and staffs with "an independent capability to challenge the organization's

thinking" by bringing the skills of diverse thinkers such as academic experts, interagency

partners, and trusted local nationals to broaden the joint staff's understanding of the

environment.[51]

Shifting the intelligence approach to *why* an adversary or operational problem has

emerged is a significant shift from its historical development.  However, it is the

fundamental difference between solving puzzles and resolving mysteries.  It requires

three interrelated adaptations to be successful.  First, intelligence must ground its

conceptual approach in theory that accounts for the characteristics of complex

environments.  Second, the intelligence practitioners must shift from a reliance on a

deductive cognitive method to one inclusive of inductive and abductive methods.  Third,

the intelligence function must retain analytic techniques, but broaden analysts' skillsets to

include advanced analytic techniques and apply these techniques in a manner logically

consistent with the characteristics of complex systems.  Together, these three adaptations

establish a significant departure from the existing conceptual approach to intelligence.

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[50] Raymond L. Garthoff, "On Estimating and Imputing Intentions," *International Security*, Vol. 2, No. 3 (Winter, 1978),  http://www.jstor.org/stable/2538512 (accessed November 5, 2015) and Mandel, "On Estimating Post-Cold War Enemy Intentions," 194.
[51] U.S. Joint Chiefs of Staff. *Joint Operation Planning*, JP 5-0, III-5.

## Conclusion

The joint force must develop a joint intelligence estimate process consistent with the characteristics of the modern environment to enable the staff's development of comprehensive campaigns. Joint doctrine reflects processes maximized for Cold War adversaries. Over the last twenty-five years, the global political, social, and economic landscape has undergone a metamorphosis. Sweeping changes in the character of the strategic and operational environments require adaptations to the joint function of intelligence.

An analysis of intelligence, from its genesis in World War I to its most recent form in the post-Cold War era, compared to the characteristics of the current strategic and operational environment proves that existing intelligence practices are obsolete. The joint function of intelligence developed processes and procedures across the twentieth century to understand what an adversary *could do* (capabilities) and then predict what an adversary *might do* (intentions) based on the successful application of deductive reasoning and traditional scientific methods. Intelligence practitioners were successful in this approach because the environment of the twentieth century was relatively uncomplicated and unconnected, presenting near-linear tendencies, and the primary adversary—the Soviets—adhered rigorously to their doctrinal models in execution of military operations. In this environment, linear regression analysis and forecasting techniques resulted in successful approximations that reinforced a concept of predictive intelligence.

In the twenty-first century, the narrow space of state-on-state armed conflict, or conventional war, coexists with conflicts arrayed across a spectrum that also includes "gray zone" conflict, irregular warfare, unconventional warfare, "hybrid war," and political warfare in which competitors seek asymmetric advantages over traditional military power to achieve political objectives.[1]  These types of conflicts are not new, but the global interconnectedness of the twenty first century (combined with social, economic, and political changes) increase the scale of complexity in which international competition occurs.  The conceptual approach to intelligence, based on deductive, linear problem solving is inadequate to observe and estimate competitor interactions and interdependencies in a complex environment.  The conditions of the environment demand a shift in the conceptual approach to intelligence from one based on a deductive scientific method and closed linear systems to one founded in theories that address the characteristics of complex systems in which multiple entities compete.[2]

In the complex modern environment, analysts are no longer able to generate near-linear approximations of the nonlinear environment for any term beyond the immediate future.  Therefore, the joint function of intelligence must shift to a focus of explaining the dynamics of the system as a whole and estimating the intent of actors within that system.  This is a shift from a prediction of *what* the adversary will do to an understanding of *why*

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[1] Strategic Landpower Task Force, "Joint Concept for Integrated Campaigning: Executive Overview Brief."
[2] Luce and Raiffa, *Games and Decisions: Introduction to Critical Survey*, 8-9.  One of the strengths of game theory is that it explains more than parlor games.  Game theory accounts for imperfect information (the inability to see the entirety of the game board or all of a competitors game pieces), cooperation (participants sharing information about the game), or collusion (participants cooperating to deny a competitor information about the game).

an actor is behaving, or interacting, as observed. It focuses on explaining a range of possible outcomes from the operational environment—the complex system—from a perspective of wholeness.

To be successful, the Joint Force must adapt its intelligence function. First, it must ground its cognitive approach to intelligence in theory that accounts for the characteristics of complex environments. Second, intelligence practitioners must shift from a reliance on a deductive cognitive method to one inclusive of inductive and abductive methods. Third, the intelligence function must retain analytic techniques, but broaden analysts' skillsets to include advanced analytic techniques and apply these techniques in a manner logically consistent with the characteristics of complex systems.

## Appendix A:  The Intelligence Phenomenon

*Appendix A provides an overview of the development of a theory of intelligence. Due to classification restrictions, intelligence professionals and academics have only recently gained access to source material from WWII through the Cold War.  This source material provides crucial evidence to support case studies that in turn inform the development of a theory of intelligence.  This appendix summarizes two contemporary hypotheses that informed the recommendation.*

Comparative study reveals what intelligence is and does.  It also identifies traits and characteristics of intelligence.  With this theoretical basis, one can better evaluate the U.S. approach to intelligence as it relates to the conditions of modern environment. Intelligence, like war, is a means of achieving political objectives.  It informs decision makers, strengthening their employment of diplomatic, information, economic, and military means of national power.  Intelligence is a sub-phenomenon of politics.

A relatively small group of researchers has developed a significant field of study on intelligence since the end of the Cold War.  The end of the Cold War coincided with the declassification of volumes of historical documents that detailed the development of the military function of intelligence through WWII and the early Cold War.  Access to these documents permitted practitioners and historians detailed study of primary source material for an era fundamental to modern intelligence practices. [1]

In 1991, Glenn Hastedt published a methodology for the comparative study of intelligence activities that represents a milestone in the development of intelligence

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[1] Michael Warner, "Building a Theory of Intelligence Systems," in Treverton and Agrell, eds., *National Intelligence Systems: Current Research and Future Prospects,"* 12.

theory.  Hastedt argued that a "force driving the comparative study of intelligence is the rapidly changing nature of the international system."[2]  He realized that the international system emerging from the Cold War raised "many questions about the relevance, place, and operation of intelligence organizations in a state's foreign policy."[3]  Since Hastedt's study, intelligence professionals, political scientists, and historians have continued to develop hypotheses to inform a theory of intelligence.[4]  Two contemporary theories worthy of note are Michael Warner's "Theory of Intelligence Systems" and Jennifer E. Sims "Theory of Intelligence and International Politics."[5]

Michael Warner is an historian with Johns Hopkins University who has worked in Office of the Director of National Intelligence and the Central Intelligence Agency as a command historian.[6]  He proposes that intelligence consists of two specialized meanings. "One definition emphasizes intelligence as something that informs decision making; the second sees intelligence as activity (often conducted in secret) that assists both the informing and executing of decisions."[7]  Emphasizing the secret nature of intelligence, Warner defines intelligence as "a service or interaction with decision makers to help them manage–by some private or privileged means–the hazards they face in dealing with rival

[2] Glenn P. Hastedt, "Towards the Comparative Study of Intelligence," *Conflict Quarterly,* .11, 3 (Summer 1991), 55-56, https://journals.lib.unb.ca/index.php/JCS/article/viewFile/14966/16035 (accessed November 29, 2015).
[3] Ibid., 57.
[4] Treverton and Agrell, eds, *National Intelligence Systems: Current Research and Future Prospects*, 12-13.
[5] Warner, "Building a Theory of Intelligence Systems," 11-37 and Jennifer E. Sims, "A Theory of Intelligence and International Politics," in Treverton and Agrell, eds, *National Intelligence Systems: Current Research and Future Prospects,"* 58-92.
[6] Johns Hopkins University, "Krieger School of Arts and Sciences: Faculty," Johns Hopkins University, http://advanced.jhu.edu/about-us/faculty/michael-warner/ (accessed November 22, 2015).
[7] Warner, "Building a Theory of Intelligence Systems," 10.

powers."[8]  Warner contends that a state's strategy, regime type, and technology determine its intelligence system and changes in these three conditions will affect its intelligence system.[9]

Dr. Jennifer E. Sims served as the Deputy Assistant Secretary of State for Intelligence Coordination and as the Department of State's first Coordinator for Intelligence Resources and Planning.[10]  Dr. Sims proposes a slightly different theory. "We may best understand intelligence as the collection, analysis, and dissemination of information for decision makers engaged in a competitive enterprise.  It is a process by which competitors improve their decision making relative to their opponents."[11]  Dr. Sims stresses the highly competitive nature of intelligence over Warner's emphasis on secrecy.  Relevance and timeliness characterize decision advantage.  Trading secrecy to gain speed or other forms of decision advantage could improve information relevance.[12]

The nuance Dr. Sims alludes to is a shift in the character of the OE.  During the Cold War, secrecy was paramount, as both superpowers were expending significant efforts trying to figure out what the other side knew.  Counterintelligence and operations security were paramount.  Speed was secondary in the relationally ponderous bipolar superpower competition.  In the modern OE, the probability of an adversary discovering what the U.S. knows before the U.S. acts on that information may be quite low.  Rapidly

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[8] Ibid., 16.
[9] Ibid., 28-32, 35.
[10] University of California, Berkeley, "Dr. Jennifer E. Sims vita," Institute of International Studies, University of California, Berkeley, http://globetrotter.berkeley.edu/people2/Sims/sims-vita.html (accessed November 25, 2015).
[11] Sims, "A Theory of Intelligence and International Politics," 61.
[12] Ibid., 62.

sharing intelligence with decision makers and sharing intelligence with non-traditional

partners may outweigh protecting information and estimates through traditional security

measures.

## Appendix B: Knowledge and Power

*Appendix B provides additional historical context to the development of state and military efforts focused on gathering adversarial information. It explains why I argue that intelligence as a military function emerged on the battlefields of WWI.*

"Now the reason the enlightened prince and the wise general conquer the enemy whenever they move and their achievements surpass those of ordinary man is foreknowledge."[1] To the sovereign, foreknowledge of the enemy, whether internal or external, provided knowledge and power.[2] This premise resonates through the ages to the modern concept of intelligence.

### The Evolution of Surveillance and Reconnaissance

*Surveillance* was a means to achieve advantage over an adversary and maintain internal political order. One way sovereigns achieved *surveillance* was by contracting spies to conduct acts of *espionage*—the trade of stealing secrets, an unchivalrous, but necessary activity to avert the devastation of war.[3] The end was control over the adversary through foreknowledge.[4] From the beginning, leaders valued two functions spies served for the state: internal and external security.

*Surveillance* and its military counterpart, *reconnaissance,* developed in an *ad hoc* nature through the nineteenth century. At the strategic level, contracted spies and, eventually, agents of the state together with nascent code breakers drew information from

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[1] Sun Tzu, *The Art of War*. Translated by Samuel B. Griffith (New York: Oxford University Press, 1963), 144.
[2] Warner, *The Rise and Fall of Intelligence*, 11-12.
[3] Ibid*.,* 11.
[4] Warner, "Building a Theory of Intelligence Systems," in Treverton and Agrell, eds *National Intelligence Systems,* 14. *Surveillance*, Warner explains, is not equivalent to spying, but a broader concept "to refer to the gathering of information about and the supervision of subject populations in organizations."

adversaries and brought the information to the sovereign.[5]  However, Western leaders

through this time expressed misgivings about the use of spies.  Spies represented an

immoral, deceptive practice to achieve a political end. [6]  Consequently, Western political

and military cultures were hesitant to embrace *surveillance* as a state operation and

distrustful of those who practiced it.

In contrast, *reconnaissance* developed on the battlefield with scouts and cavalry

providing information about enemy forces to the commander.  Because of their daring,

they gained glory in military culture.[7]  However, it was the role of the commander to

interpret the nuggets of information and determine their meaning.  Carl von Clausewitz

highlighted a lack of trust commanders had in reconnaissance reports stating that, "many

intelligence reports in war are contradictory; even more are false, and most are

uncertain."[8]

*Surveillance* and *reconnaissance* developed in an *ad hoc* manner, until WWI when

changes driven by three military revolutions created the political, social and economic

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[5] Warner, *The Rise and Fall of Intelligence*, 13-16.  In 1467, Leon Battista Alberti invented a
polyalphabetic cipher, which provided a simple method of encrypting and decrypting messages.  From this,
a third specialty emerged--cryptology.  By 1506, states had created offices to break ciphers and reveal state
communiques.
[6] Ibid., 21.  In 1895, a British colonel articulated the moral tension spies presented.  "The very term spy
conveys to our mind something dishonourable and disloyal.  A spy…is a low sneak, from unworthy
motives, dodges the actions of his fellow beings, to turn the knowledge he acquires to his personal
account."  Nevertheless, he juxtaposes that view with, "In war spies are indispensable auxiliaries; and,
when we are precluded from obtaining information by any other means, we must discard all question of
morality.  We must overcome our feelings of repugnance for such an unchivalrous measure, because it is
imposed on us by sheer necessity."
[7] Ibid., 51-52.  Commanders and the public viewed scouts differently than spies, because they remained in
uniform and relied on "speed and stealth to avoid a fight rather than mass firepower to win one."
[8] Carl von Clausewitz, *On War,* ed. and trans. Michael Howard and Peter Paret, (Princeton, NJ: Princeton
University Press, 1984), 117.

conditions that resulted in a form of politics and warfare dependent on access to

adversarial information.

### The Strategic and Operational Effects of Military Revolutions

A military revolution is the result of "systemic changes in politics and society" that

"fundamentally changes the framework of war."[9]  The first four military revolutions

contributed to the strategic conditions that resulted in states organizing *surveillance* and

*reconnaissance* into the function of intelligence.  The establishment of the primacy of the

state and its interests in 1648 created the need for states to maintain organized

militaries.[10]  The French Revolution introduced mass politics and, with it, mass armies.[11]

Mass armies created the need for states to organize systems of command and control with

staff providing estimates to the commander.[12]  The Industrial Revolution created mass

production, resulting in reductionist methodologies for management and work

processes.[13]  WWI merged the mass politics of the French Revolution and mass

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[9] Knox and Murray, eds., *The Dynamics of Military Revolution:  1300-2050*, 6-7.

[10] Gregory Brown, "Principles of the State System," University of Nevada Las Vegas website, https://faculty.unlv.edu/gbrown/westernciv/wc201/wciv2c10/wciv2c10lsec2.html (accessed January 5, 2015).  With the signing of the Peace of Westphalia in 1648, a new state system emerged in Europe that established the principles of sovereignty of the state and *raison d'état*, or "reason of state," establishing the primacy of state interests.  It also introduced the idea of balance of power that implied order would exist if the major European powers maintained a political-military equilibrium, resulting in states maintaining well-organized militaries.

[11] MacGregor Knox, "Mass Politics and Nationalism as Military Revolution:  The French Revolution and After," in Knox and Murray, eds., *The Dynamics of Military Revolution:  1300-2050,* 57-58, 62-66.

[12] Ibid., 65-66 and Geoffrey Parker, ed., *Cambridge Illustrated History:  Warfare* (New York:  Cambridge University Press, 1995), 206.  To solve the problem of command and control, Napoleon developed corps and divisions with associated command and staff structures.  However, the experience and education of post-revolution French officers limited their effectiveness.  French commanders relied on *coup d' oeil* to synthesize information and coordinate actions.  Gerhard von Scharnhorst, a nineteenth century Prussian general, identified the need for a thinking staff to sort the confusion of the Napoleonic battlefield.

[13] Parker, ed., *Cambridge Illustrated History:  Warfare*, 216-241; Mark Grimsley, "Surviving Military Revolution: The U.S. Civil War," in Knox and Murray, eds., *The Dynamics of Military Revolution:  1300-2050*, 74-77; and Dennis E. Showalter, "The Prusso-German RMA, 1840-1871," in Knox and Murray, eds., *The Dynamics of Military Revolution:  1300-2050,* 93-93, 96-99, 103-106.  The Industrial Revolution

production of the Industrial Revolution creating the operational conditions that drove

states to organize intelligence as new military craft.

On the tail of the Industrial Revolution, the U.S. experienced a prelude to modern

warfare in the U.S. Civil War. In many ways, the Civil War foreshadowed WWI because

it "combined mass politics and passions of the Wars in the French Revolution with the

technology, productive capacity, and managerial style emerging from the Industrial

Revolution."[14] The effect was an uncompromising, absolute war waged across vast

distances with the aim of total destruction of the adversary.[15] In it, the demand for the

organization of information led to the first, fleeting effort to establish a military

information office at the army level. This effort began with the creation in 1838 of the

U.S. Army Corps of Topographic Engineers to provide topographic and cultural

information of the regions beyond the Mississippi River.[16] It was on this footing that the

North and the South entered the Civil War.

During the Civil War, commanders approached the processing of battlefield

information differently with most directly receiving the information, similar to the

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transformed the scale at which states could provision their militaries through mass production. It also
contributed to the expansion of the battlefield through increases in weapon lethality. Most importantly, the
Industrial Revolution greatly increased the speed with which commanders could communicate and move
forces. The introduction of steamships and railways created unprecedented strategic mobility while the
telegraph provided a means of communication to overcome extended strategic and operational geography.
[14] Mark Grimsley, "Surviving Military Revolution: The U.S. Civil War," in Knox and Murray, eds., *The
Dynamics of Military Revolution: 1300-2050*, 75.
[15] Ibid., 75 and Parker, ed., *Cambridge Illustrated History: Warfare*, 220-221.
[16] Bigelow, "A Short History of Army Intelligence," 4. Bigelow notes, "(The) Army of the new nation did
practically nothing in the way of collecting and analyzing information about potential enemies. At the
national level, the War Department's central staff mainly concentrated on questions of administration and
supply rather than operational planning. In the field, commanders served as their own intelligence officers,
relying on simple reconnaissance by scouts or cavalry."

European armies.  Neither side had a centralized intelligence organization or process.

However, in 1863 Major General Joseph Hooker, commander of the Army of the

Potomac, established the Bureau of Military Information (BMI) as a permanent part of

his staff.  With seventy to eighty men and a dedicated force of scouts, the BMI provided

collection and analysis of battlefield information and provided estimates to the

commander.  The BMI proved valuable by providing accurate Confederate order of battle

information, informing operational planning.  When the Civil War ended in 1865, the

army disbanded the BMI, losing the learned concepts and methods.[17]

None of the first three military revolutions had an immediate effect on the *ad hoc*

development of state *surveillance* and battlefield *reconnaissance* in Europe or North

America.  However, each contributed to the maelstrom of conditions that would force the

organization of *surveillance* and *reconnaissance* into intelligence as the Great Powers

entered the twentieth century and WWI.  The development of state and military

intelligence reflects these political, social, and economic conditions.

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[17] Ibid., 8-9.

# Appendix C:  A Thought Experiment

## An Application of Complexity, Systems, and Game Theory

*Appendix C applies the concepts in the recommendation to open source information about the ongoing conflict in the Levant.  It demonstrates an application of abductive reasoning and aggregation analysis, framed by modern theory, to explain the operational environment.*

The current situation in the Levant provides a venue to demonstrate the application of General System Theory (GST), complexity theory, and game theory as an approach to understanding the environment.  The Levant serves as an example of an n-player, non-zero sum, non-cooperative game unfolding within a complex environment.  Within that region, there are at least three distinct conflicts, or games, which interconnect into a larger single game.  The first conflict is between the government of Syria and multiple non-state organizations opposed to the government of Syria.  The second conflict is between the Islamic State of Iraq and the Levant (ISIL), the government of Syria, the government of Iraq, and multiple non-state organizations, some of whom oppose ISIL and some support ISIL.  The third conflict is between the government of Iraq and multiple non-state organizations opposing the government of Iraq.  Extra-regional states are engaged in one or more of the conflicts, including France, Iran, Russia, and the U.S.  Finally, multiple international organizations and commercial entities are involved in the three conflicts.[1]

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[1] Orlando Crowcroft, "Syria Conflict:  Who Are the Major Players Fighting in the Bloody Syrian Civil War?" *International Business Times* website, http://www.ibtimes.co.uk/syria-conflict-who-are-major-players-bloody-complex-civil-war-1522027 (accessed January 8, 2016) and Alexandra Zavis, "Who's Who in Syria: A Look at 8 Key Players in the War," *Los Angeles Times* website http://www.latimes.com/world/middleeast/la-fg-syria-players-syria-war-20151002-htmlstory.html (accessed January 8, 2016).

In many cases, the organizations involved in the Levant have objectives in more than one of the three conflicts. The conflict is truly n-player. The number of competitors is constantly changing. It is a non-zero sum game because there is not a single object that one side will "win" and other will "lose." Each competitor seeks a set of objectives, some of which are negotiable or mutable as the conflicts endure. Finally, the conflict is non-cooperative in that multiple actors are cooperating and colluding to varying degrees with each other depending on the conflict. The U.S. is cooperating with Russia to deconflict assets, while Russia is competing against the U.S. regarding its support to the government of Syria.

From a systems perspective, the interconnectedness of the violent actors with global actors is clear. The conflict in the Levant is characteristic of war in that it includes the employment of violence to achieve political objectives. However, states no longer hold a monopoly on the employment of violence and the entities involved do not limit their employment of violence on other "military" forces. In fact, the competitors do not contain their violence to the "battlefield" of the Levant. ISIL has claimed credit for at least two extra-regional attacks against civilian targets designed to influence French and Russian state policy.

The competitors engaged in the Levant are no longer dependent on organic logistics and communication capabilities. Competitors are exploiting commercially available transportation, logistics, and information infrastructures to sustain their actions and influence other competitors. Information has gained an unprecedented value in modern conflict. The use of social media to recruit and message is central to many of the

competitors' strategies. These characteristics define one "space" of warfare in the twenty-first century.

The Levant environment demonstrates complexity. For example, the November 2015 ISIL attack in Paris, France reflect the tendencies of nonlinearity, self-organization, and disproportionate outcomes.[2] First, it was nonlinear because a small group of attackers, directed from the Levant, achieved a global response by conducting an attack geographically separated from the main area of conflict. Second, ISIL's use of the global social media network to coordinate and inspire the attack reflects the self-organizing characteristic of the organization. Third, the French and Dutch governments responded disproportionally to the scale of the attack, with the French president declaring "war" on ISIL, a non-state entity and both countries rapidly passing laws, restricting individual liberties. By conducting a small arms attack on a handful of civilian targets, ISIL drove the French government to place French security forces on a war footing, achieved an indirect acknowledgement of sovereignty, and significantly limited Europeans' civil liberties.

Staff planning processes must account for the multiple overlapping conflicts and wide array of competitors operating through these conflicts. It must be able to identify where the conflicts and their actors interconnect. It must be able to identify root causes of conflict and eliminate the cause, not necessarily the fighter.

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[2] Jethro Mullen and Margot Haddad, "'France is at War,' President Francois Hollande says after ISIS Attack," Cable News Network (CNN) website, http://www.cnn.com/2015/11/16/world/paris-attacks/ (accessed February 14, 2016).

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# Bibliography

Abraham, Ralph H. "The Genesis of Complexity," http://www.ralph-abraham.org/articles/MS%23108.Complex/complex.pdf (accessed February 13, 2016).

Amagoh, Francis. "Perspectives on Organizational Change: Systems and Complexity Theories." *The Innovation Journal: The Public Sector Innovation Journal*, Volume 13(3), 2008, article 3. http://www.innovation.cc/peer-reviewed/amagoh3dec2008jag2rev1.pdf (accessed February 13, 2016).

Atkinson, Rick. *An Army At Dawn: The War in North Africa, 1942-1942.* New York: Henry Holt and Company, 2002.

Bertalanffy, Ludwig Von. "The History and Status of General Systems Theory." *The Academy of Management Journal*, Vol. 15, No. 4, General Systems Theory (Dec.,1972), pp. 407-426. http://www.jstor.org/stable/255139 (accessed February 13, 2016).

Beyerchen, Alan. "Clausewitz, Nonlinearity, and the Unpredictability of War." *International Security*, Vol. 17, No. 3 (Winter, 1992-1993), 59-90. http://www.jstor.org/stable/2539130 (accessed November 27, 2015).

Bigelow, Michael E. "A Short History of Army Intelligence." Federation of American Scientists, U.S. Army Selected Intelligence-Related Sources website, https://fas.org/irp/agency/army/short.pdf (accessed January 5, 2016).

Boulding, Kenneth E. "General Systems Theory: The Skeleton of Science." Originally published in *Management Science*, 2 (1956): 197-208. Republished with permission by Kurt Richardson in *E:CO Special Double Issue* Vol. 6 Nos. 1-2 2004, 127-139, http://emergentpublications.com/eco/ECO_other/Issue_6_1-2_18_CP.pdf (accessed February 14, 2016).

Brown, Gregory. "Principles of the State System." University of Nevada Las Vegas website. https://faculty.unlv.edu/gbrown/westernciv/wc201/wciv2c10/wciv2c10lsec2.html (accessed January 5, 2015.)

Butte College. "Tip Sheet: Deductive, Inductive, and Abductive Reasoning." Butte College website. https://www.butte.edu/departments/cas/tipsheets/thinking/reasoning.html (accessed December 8, 2015).

Clausewitz, Carl von. *On War.* Edited and translated by Michael Howard and Peter Paret. Princeton, NJ: Princeton University Press, 1984.

Coles, John P. "Full Spectrum Intelligence Support for the Joint Commander: Incorporating Cultural Intelligence into Joint Doctrine." A paper submitted to the Department of National Security Decision Making, Naval War College, 2005. Defense Technical Information Center database. http://www.dtic.mil/dtic/tr/fulltext/u2/a464552.pdf (September 3, 2015).

Crowcroft, Orlando. "Syria Conflict: Who Are the Major Players Fighting in the Bloody Syrian Civil War?" *International Business Times* website. http://www.ibtimes.co.uk/syria-conflict-who-are-major-players-bloody-complex-civil-war-1522027 (accessed January 8, 2016).

Dixit, Avinash and Barry Nalebuf. "Game Theory." *The Concise Encyclopedia of Economics*. Library of Economics and Liberty. http://www.econlib.org/library/Enc/GameTheory.html (accessed November 27, 2015).

Echevarria, Antulio. "Clausewitz's Center Of Gravity: It's Not What We Thought." *Naval War College Review,* Volume 56, Number 1 (Winter 2003*)*, 108-123. https://www.usnwc.edu/getattachment/d863be95-597d-4220-8cb6-169c80ca1f6b/Clausewitz-s-Center-of-Gravity--It-s-Not-What-We-T (accessed February 14, 2016).

Echevarria, Antulio J. "How Should We Think About "Gray-Zone" Wars?" *Infinity Journal*, Volume 5, Issue 1. https://www.infinityjournal.com/article/158/How_Should_We_Think_about_Gray Zone_Wars/ (accessed January 7, 2016).

Eisenhower, Dwight D. *Crusade in Europe.* Baltimore: Johns Hopkins University Press, 1948.

Emme, Eugene M. "Technical Change and Western Military Thought: 1914-1945." *Military Affairs*, Vol. 24, No. 1 (Spring, 1960), pp. 6-19. http://www.jstor.org/stable/1983567 (accessed August 24, 2015).

Fishbein, Warren and Gregory Treverton. "Making Sense of Transnational Threats." A Kent Center Occasional Paper posted on the Central Intelligence Agency Library page. https://www.cia.gov/library/kent-center-occasional-papers/pdf/OPV3No1.pdf (accessed December 27, 2015).

Flynn, Michael T., Matt Pottinger, and Paul D. Batchelor. "Fixing Intel: A Blueprint for Making Intelligence Relevant in Afghanistan. Center for New American Security *Voices from the Field,* January 2010. https://www.cnas.org/files/documents/publications/AfghanIntel_Flynn_Jan2010_code507_voices.pdf (accessed December 30, 2015).

Garamone, Jim.  "Africom Campaign Plan Targets Terror Groups."  DoD News, Defense Media Activity.  http://www.defense.gov/News-Article-View/Article/639919/africom-campaign-plan-targets-terror-groups (accessed January 6, 2016).

Garthoff,  Raymond L.  "On Estimating and Imputing Intentions." *International Security*, Vol. 2, No. 3 (Winter, 1978).  http://www.jstor.org/stable/2538512 (accessed November 5, 2015).

Goldbert, Samuel.  *Probability: An Introduction*.  New York: Dover Publications Inc, 1960.

Hall, Wayne Michael and Gary Citrenbaum.  *Intelligence Analysis: How to Think in Complex Environments.*  Santa Barbara, CA:  Praeger Security International, 2010.

Hastedt, Glenn P.  "Towards the Comparative Study of Intelligence." *Conflict Quarterly,* (Summer 1991), 55-72.  https://journals.lib.unb.ca/index.php/JCS/article/viewFile/14966/16035 (accessed November 29, 2015).

Hayden, Mike.  "Politicization of Intelligence on Islamic State Fight." *The Washington Times* website, dated September 24, 2015.  http://www.washingtontimes.com/news/2015/sep/24/politicization-the-shading-of-analysis-to-fit-prev/?page=all (accessed February 5, 2016).

Haywood, Oliver.  "Military Decision and Game Theory," *Journal of the Operations Research Society* 2, NO. 4 (November 1954), 365-385.

Johns Hopkins University.  "Krieger School of Arts and Sciences: Faculty." Johns Hopkins University.  http://advanced.jhu.edu/about-us/faculty/michael-warner/ (accessed November 22, 2015).

Jupiter Scientific.  "Definitions of Important Terms in Chaos Theory."  Jupiter Scientific website.  http://www.jupiterscientific.org/sciinfo/chaos.html (accessed February 15, 2016).

Kaldor, Mary.  *New and Old Wars:  Organized Violence in a Global Era,* Third Edition.  Stanford, CA:  Stanford University Press, 2012.

Knox, MacGregor.  "Mass Politics and Nationalism as Military Revolution:  The French Revolution and After."  In *The Dynamics of Military Revolution:  1300-2050,* edited by MacGregor Knox and Williamson Murray, 57-73.  New York:  Cambridge University Press, 2001.

Laszlo, Alexander and Stanley Krippner.  "Systems Theories:  Their Origins, Foundations, and Development."  Published in J.S. Jordan ed., *Systems Theories and A Priori Aspects of Perception,* Chapter 3, 47-74. Amsterdam:  Elsevier

Science, 1998. http://terras-altas.net.br/MA-2013/statistics/Systems%20Theories/SystemsTheory-Alexander%20Laszlo%20and%20Stanley%20Krippner.pdf (accessed February 13, 2016).

Luce, R. Duncan and Howard Raiffa. *Games and Decisions: Introduction to Critical Survey.* New York: Dover Publications, 1957.

Mandel, Robert. "On Estimating Post-Cold War Enemy Intentions." *Intelligence and National Security*, Volume 24, Issue 2 (April 2009): 194-215. https://web-a-ebscohost-com.nduezproxy.idm.oclc.org/ehost/detail/detail?sid=b28a3844-1994-4ee2-8de5-420994ce752d%40sessionmgr4004&vid=26&hid=4104&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#AN=40627139&db=tsh (accessed September 16, 2015).

McChrystal, Stanley with Tatum Collins, David Silverman, and Chris Fussel. *Team of Teams: New Rules of Engagement for a Complex World.* New York: Penguin Random House, 2015.

Murray, Williamson, and Allan R. Millett. *Military Innovation in the Interwar Period.* Cambridge: Cambridge University Press, 1996.

—. *A War to be Won: Fighting the Second World War.* Cambridge, MA: Harvard University Press, 2000.

Nau, Robert. "Notes on Linear Regression Analysis." Fuqua School of Business, Duke University website. http://people.duke.edu/~rnau/Notes_on_linear_regression_analysis--Robert_Nau.pdf (accessed February 14, 2016).

Nye, Joseph S. Jr. "Peering into the Future." *Foreign Affairs*, 77, 4 (July/August 1994).

Parker, Geoffrey, ed. *Cambridge Illustrated History: Warfare.* New York: Cambridge University Press, 1995.

Pomerantsev, Peter. "Brave New War." *The Atlantic* online. http://www.theatlantic.com/international/archive/2015/12/war-2015-china-russia-isis/422085/ (accessed December 30, 2015).

Romjue, John L. "The Evolution of the AirLand Battle Concept." *Air University Review,* May-June 1984. http://www.airpower.maxwell.af.mil/airchronicles/aureview/1984/may-jun/romjue.html (accessed February 7, 2016).

Ross, Don. "Game Theory." *The Stanford Encyclopedia of Philosophy* (Winter 2014 Edition), Edward N. Zalta, ed.

http://plato.stanford.edu/archives/win2014/entries/game-theory/ (accessed October 14, 2015).

Sims, Jennifer E. "A Theory of Intelligence and International Politics," in Treverton. 58-92.

Stavridis, James G. "An Intelligent Theater." *JFQ: Joint Force Quarterly*, Issue 56 (1st Quarter 2010): 104-108. https://web-a-ebscohost-com.nduezproxy.idm.oclc.org/ehost/detail/detail?sid=b28a3844-1994-4ee2-8de5-420994ce752d%40sessionmgr4004&vid=5&hid=4104&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#AN=48169428&db=aph (accessed September 16, 2015).

Strategic Landpower Task Force. "Future Joint Force Concepts Focus on Human Elements." U.S. Army news website. Article posted on January 22, 2015. http://www.army.mil/article/141535/Future_joint_concepts_focus_on_human_elements/ (accessed October 12, 2015).

Strategic Landpower Task Force. "Joint Concept for Integrated Campaigning: Executive Overview Brief." Unpublished information briefing dated October 24 2015, used with permission granted November 16, 2015.

Treverton, Gregory F. and Wilhelm Agrell, eds. *National Intelligence Systems: Current Research and Future Prospects.* New York: Cambridge University Press, 2009.

Treverton, Gregory F. "What Should We Expect of Intelligence." http://www.foia.cia.gov/sites/default/files/document_conversions/17/20110525.pdf (accessed December 29, 2015)

Tzu, Sun. *The Art of War.* Translated by Samuel B. Griffith. New York: Oxford University Press, 1963.

University of California, Berkeley. "Dr. Jennifer E. Sims vita." Institute of International Studies, University of California, Berkeley. http://globetrotter.berkeley.edu/people2/Sims/sims-vita.html (accessed November 25, 2015).

University of Toronto. "Deductive and Inductive Reasoning." University of Toronto Mathematics Network website. http://www.math.toronto.edu/mathnet/questionCorner/deductive.html (accessed December 8, 2015).

U.S. Department of the Army. *The Soviet Army:  Operations and Tactics,* Field Manual 100-2-1. Washington, DC:  Department of the Army, July 16, 1984.

U.S. Joint Chiefs of Staff. *Department of Defense Dictionary of Military and Associated Terms.* Joint Publication 1-02. Washington, D.C.: Joint Chiefs of Staff, 8 November 2010 (As Amended Through 15 October 2015).

—. *Joint Intelligence*. Joint Publication 2-0. Washington, D.C.: Joint Chiefs of Staff, October 22, 2013.

—. *Joint Intelligence Preparation of the Operational Environment*. Joint Publication 2-01.3. Washington, D.C.: Joint Chiefs of Staff, May 21, 2014.

—. *Joint Operations*. Joint Publication 3-0. Washington, D.C.: Joint Chiefs of Staff, August 11, 2011.

—. *Joint Operation Planning*. Joint Publication 5-0. Washington, D.C.: Joint Chiefs of Staff, August 11, 2011.

U.S. President. *National Security Strategy.* Washington DC: Government Printing Office, February 2015.

Waldrop, M. Mitchell. *Complexity: The Emerging Science at the Edge of Order and Chaos.* New York: Touchstone, 1992.

Walker, Paul. "A Chronology of Game Theory." University of Canterbury, New Zealand website, entry posted September 2012. http://www.econ.canterbury.ac.nz/personal_pages/paul_walker/gt/hist.htm (accessed October 14, 2015).

Walsh, Nick Paton and Masoud Popalzai. "4 killed in Afghanistan amid Outrage over Quran Burning." Cable News Network (CNN) website. http://www.cnn.com/2012/02/25/world/asia/afghanistan-burned-qurans/ (accessed February 15, 2016).

Warner, Michael. "Building a Theory of Intelligence Systems," in Treverton, 11-37.

—. *The Rise and Fall of Intelligence: An International Security History.* Washington, D.C.: Georgetown University Press, 2014.

Zavis, Alexandra. "Who's Who in Syria: A Look at 8 Key Players in the War." *Los Angeles Times* website http://www.latimes.com/world/middleeast/la-fg-syria-players-syria-war-20151002-htmlstory.html (accessed January 8, 2016).

**Vita**

Colonel Frank A. Smith was commissioned into the United States Army in 1992 as a Military Intelligence officer following graduation from Embry-Riddle Aeronautical University in Prescott, Arizona. He participated in the United Nations Mission in Haiti (UNMIH), Multinational Force and Observers (Sinai, Egypt), Operation IRAQI FREEDOM and Operation ENDURING FREEDOM. He has served as a company commander and battalion commander and as an Army staff intelligence officer at the battalion, brigade, division, and corps levels. He most recently served as the Deputy G-2, I Corps at Joint Base Lewis-McChord, WA. COL Smith is a graduate of the U.S. Army Command and General Staff Officer Course and the School of Advanced Military Studies. He holds a Master of Military Arts and Science and a Masters of Business Administration.